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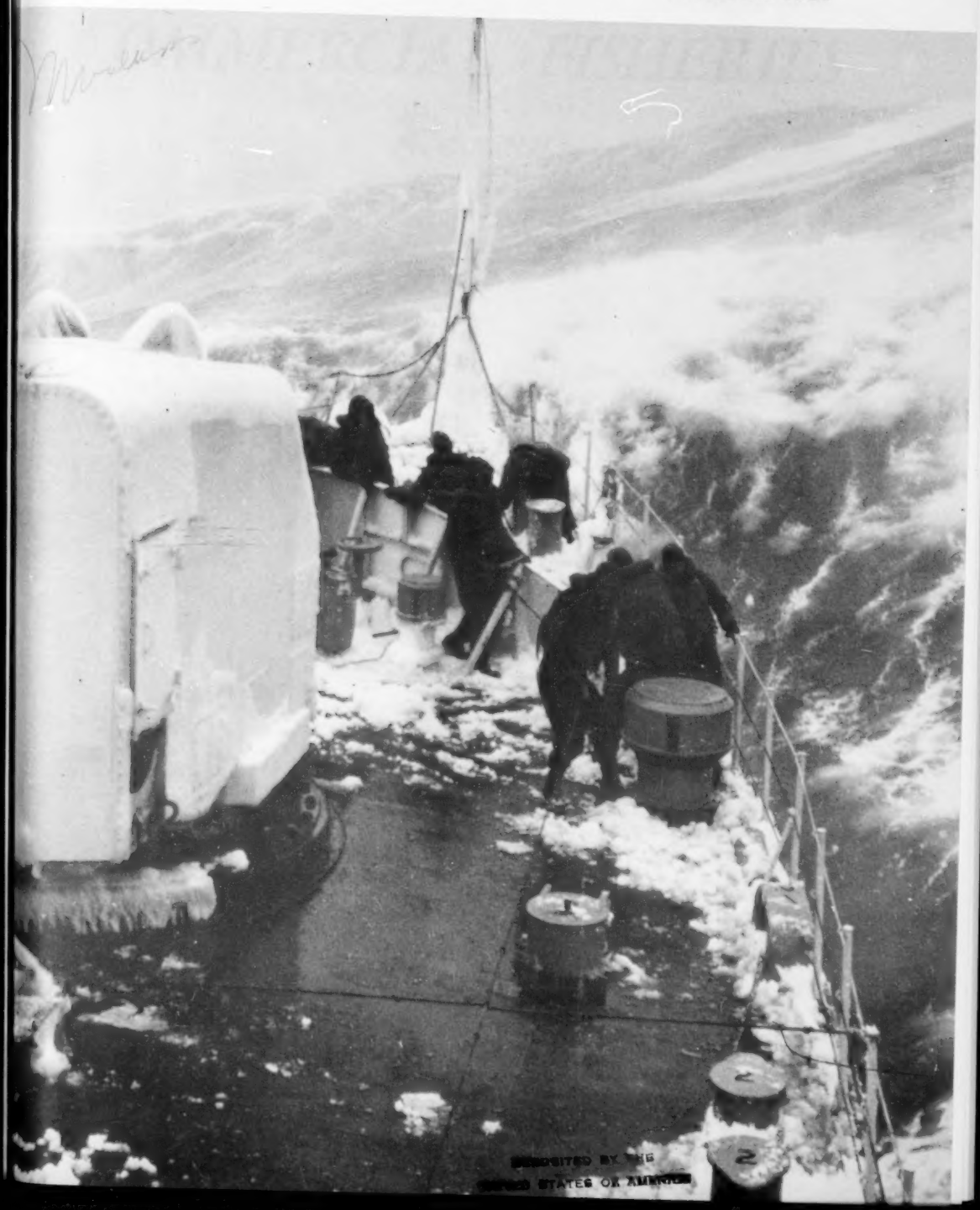

COVER: The Wintry Atlantic.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

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Throughout this book, the initials BCF stand
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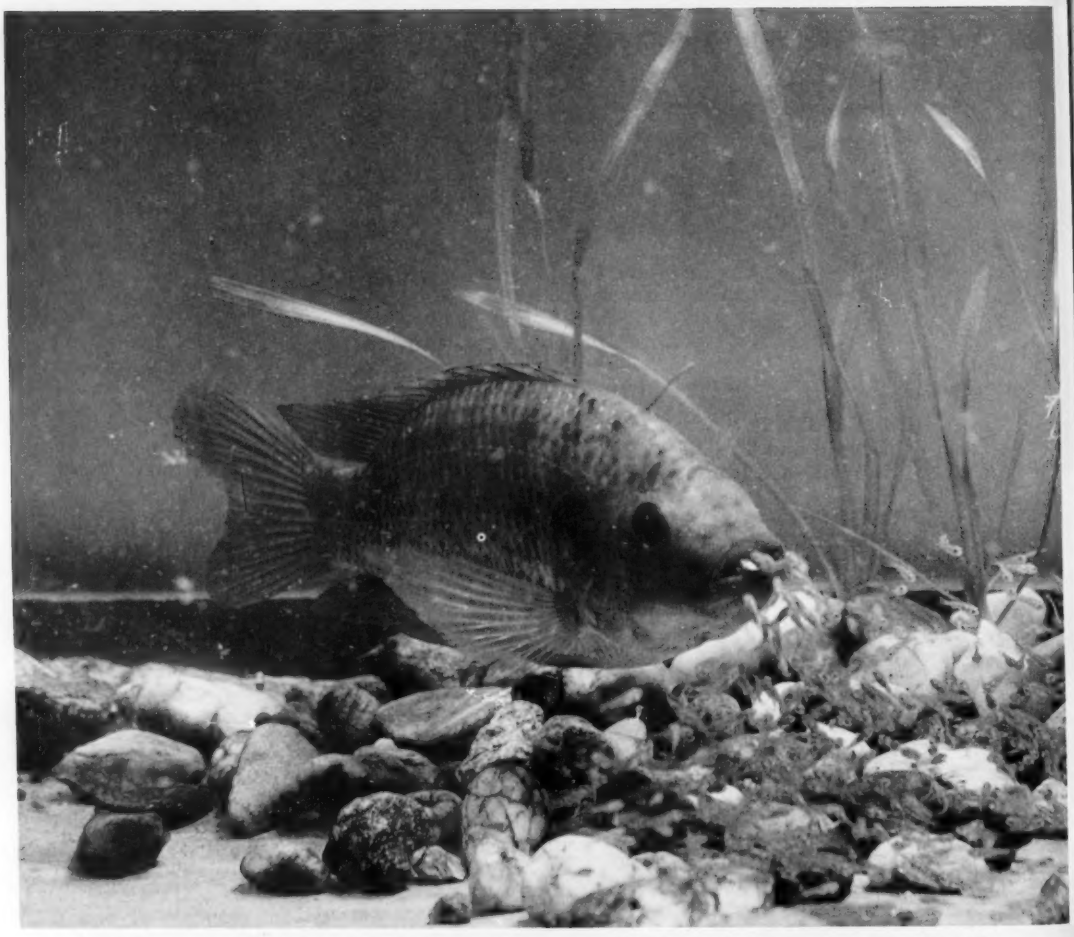


Tilapia fry seek shelter in their mother's mouth when frightened--here, by the photographer's flash. (FAO)

STRUGGLE TO CLOSE PROTEIN GAP REPORTED BY 60 NATIONS

Sixty members of the United Nations family have responded to a questionnaire from the world organization asking what they are doing now and what they propose to do in the next 5 years to improve and increase "the production and human consumption of protein." Their answers, reflecting the state of their economic condition, prompted Secretary General Thant to warn about the "crippling urgency" of finding a solution to the problem.

The UN sent the questionnaire because it is studying a "possible reallocation of the resources" the agency itself is using to close the protein gap. It has compiled the answers in "The Protein Problem," along with statements by its own agencies: WHO, FAO, UNICEF, and the Protein Advisory Group (PAG).

From the 60 answers, the report states, "it is clear that there is widespread support for an immediate emphasis on the use of conventional sources of supply to meet protein needs." There is general recognition that "unconventional sources of protein will play an increasingly critical role."

For all nations, in all parts of the world, "the heart of the matter is to ensure adequate consumption of protein by the very young and by pregnant and lactating women."

THE PROBLEM IS NOW

The report rings an alarm: "The size, urgency, and rapid emergence of this problem must be fully understood. About half the population of the developing world is under the age of twenty years and about a quarter is below the age of eight. Thus, the number of growing children is already very large, and, irrespective of the effectiveness of present and future programmes to limit population growth, the young people already alive will themselves soon become the parents of yet more children. The key to the protein problem is to have sufficient supplies of appropriate foods, that will be accepted and actually consumed, ready in time to feed the children who will inevitably be born within the next few years. Indeed, the remainder of this century is likely to be crucial for mankind."

And the report emphasizes: "No blueprint for the solution of the problem can be developed by those unfamiliar with local problems. Plans which have any chance of being applied can be made only by those on the spot and aware of all the circumstances. Plans which do not lead to appropriate action do not help to solve the protein problem."

UN GROUP'S RECOMMENDATIONS

The Protein Advisory Group (PAG) to the UN's FAO/WHO/UNICEF, commenting on the replies, stated: "Because the largest volume of protein must come from conventional animal plant and fishery sources, which are currently the most acceptable and desired foods, their production, preservation, and storage must receive primary emphasis."

Concerning fishery resources, PAG recommended:

- "Improvement in the efficiency and broadening scope of both marine and inland fisheries, including fish farming. Investigations in this area must include methods of distribution, preservation, and marketing."

- The development of fish protein concentrate (FPC) and its uses in forms suited to local conditions. "Actual production should be encouraged in developing countries with substantial marine resources but only after preliminary trials have demonstrated that a wholesome product can be made from available raw materials and will have practical food use."

- "Encourage the development of fisheries with particular reference to the creation of demand for fish and fish products and the development of economic preservation and distribution techniques."

FISH

Fish is one of the best sources of protein in quality and quantity. But it can contribute more to world protein supplies than it does

now. The factors contributing to this condition are inadequate fishing boats and gear, shortage of trained fishermen, difficulties in preserving fish, a highly perishable food, and dislike of fish in some countries.

The answers to the UN questionnaire report the worldwide efforts to improve marine and freshwater fisheries. These efforts seek to identify and assess new sources of fish; conserve fishery resources; promote development of commercial fisheries in order to catch, process, and distribute widely fish and fish products acceptable to the public.

The UN Report points out that a country eager to modernize its fishing industry needs many modern fishing vessels with refrigerating and freezing capacity, fishermen trained to use this equipment, and transport, storage, and marketing facilities. Even if funds exist to build and operate such facilities, it would take too long to produce food that could have "quick impact on the protein problem. The production of marine fish may have to be a long-term aim."

The following reports reveal the state of affairs in the reporting nations--and also illustrate that of many other nations:

ASIA

INDONESIA: The long-term aim was accepted by Indonesian scientists studying the protein problem. They decided that it would take more ships and facilities to improve sea fishing quickly enough than can be "pressed into service immediately." In the short run, effort should be concentrated on developing inland or brackish water fisheries. These are easier to improve with existing knowledge, and immediate costs are less.

PHILIPPINES: The government is concentrating on fish rather than on livestock in its efforts to increase protein sources because the country has great fisheries potential--and it is less expensive than developing livestock production. Its first planned activity is to increase the area of fish ponds, especially in brackish water.

Its other activities show how expensive it is to develop a marine-fishing industry. It needs more vessels, greater efficiency of present vessel equipment, a pier, dry-docking space, and marketing facilities and refrigerated warehouses to store catch. It plans to ask the aid of FAO experts now on the islands to locate regional fishing ports and harbors.

SINGAPORE: Its first aim is to increase fish-pond productivity. Also, it is carrying out schemes to improve marine fisheries. A fish-training institute is being set up at Changi with the help of the UN Development Program to train off-shore and deep-sea fishermen. A marine fisheries research department is being organized at Changi, sponsored by the South-East Asian Development Center, with help from several South-East Asian countries and Japan.

This department "will function to develop fishing grounds by experimental fishing; to research into fishing gears, equipment, fishing methods and handling of fish at sea; to investigate fisheries resources and fisheries oceanography; and to train research personnel. The department will be equipped with a modern research vessel."

At the Jurong Industrial Wharf, a modern, multimillion-dollar harbor complex is being built. The harbor itself is completed. Other shore-supporting facilities--ice plants, cold rooms, and processing installations--are being set up. A central fish-auction market is being built and subsidiary markets are planned for other places. Private enterprise is being encouraged to take part. A few joint fishing ventures involving more advanced fishing nations have begun, and negotiations for others are well advanced.

The Singapore Economic Development Board gives loans to finance large fishing enterprises. The Primary Production Department plans a loan scheme for small fishermen and cooperatives.

The UN Report explains that it has detailed Singapore's operations "to illustrate the complexity of developing fisheries, the need for international cooperation and cooperation between Governments and private industry and the expense involved."

SOUTH VIETNAM: It is being helped by the United Nations Development Program (UNDP) to study the fish potentialities of the continental shelf.

SOUTH KOREA: Between 1962 and 1966, "there was remarkable development of fisheries in the republic. The government plans to increase production at a 15% annual rate

during the Second Five-Year Economic Development (1967-1971).

LATIN AMERICA

The FAO/UNDP Regional Central American Fishery Development Project covers several countries, including El Salvador, Mexico, and Panama. It will go on for 5 years. Its immediate goals are to gather information about fish resources, including crustaceans, in the Atlantic through exploratory fishing and laboratory study. The aim is industrial production and marketing--and improvement of the professional competence of fishery researchers in the area.

VENEZUELA: A 1967 agreement with FAO and UNDP makes possible the country's most comprehensive program of fishery research and development.

MEXICO: The National Biological Research Institute "is investigating the area, size, structure, and potential of known fishing grounds" and is trying to find new ones. It aims to develop the fishing industry and make it more efficient.

PANAMA: It is administering an FAO project to promote the eating of herrings. These are abundant in coastal waters, can be sold much cheaper than other fish--and have never been caught in commercial quantities or marketed on a large scale because they were not in demand.

EL SALVADOR: The government gives credits and technical assistance to those with artificial ponds for fish farming. Lakes are stocked with high-yielding fish. The "flourishing shrimp fisheries" are worked by 73 vessels, but nearly 80% of the catch is exported; only 1.5% is used for domestic consumption. There is a project to promote fish consumption under the Regional Fisheries Development Project.

PERU: 98% of the marine fish landed is used by the fish-meal and fish-oil industries; the remainder is eaten. Many species of available fish are not eaten. Little is known about fishing the countless rivers, lakes, and lagoons. Trout is abundant in Lake Titicaca in the Andean region; and it is popular fresh and preserved. Three firms produce canned trout.

Several government programs seek to develop fishery resources. It is state policy to encourage fishing for food fish. Peru provides tax exemptions especially for fishermen's cooperatives. Fishery activities are given credit priorities. Training is provided to operate cooperatives. There is an educational plan to promote the eating of fish.

The major obstacles to developing fishing for human use are: traditional industry methods; lack of knowledge of Peru's fishery resources; few firms interested in fish for human use; and demand is limited by high prices caused by poor marketing system and poor display. The government hopes these will be overcome by the Sectoral Fishery Plan, an integral part of the 1967-1970 Economic and Social Development Plan.

A 1964 decree contained incentives to promote industrial production of cheap protein foods for people. The decree exempts machinery and raw materials. It offers tax incentives to stimulate investment. All projects must be approved by the Institute of Nutrition, Ministry of Health and Social Welfare. The food to be produced must contain 10-70% protein.

GUYANA: The Ministry of Agriculture long has tried to develop marine fisheries. It provides credit, duty-free concessions for gasoline, oil, and nets, large discounts on ice purchases--and landing facilities in cities and rural areas. The government supplies selected species of freshwater fish to farmers who want to develop fish ponds. The fish are raised in carefully designed ponds and provide protein food for the farmers.

AFRICA

The UN report states that "essentially similar reports come from Africa."

ETHIOPIA: "Although Ethiopia's inland waters and the coast of the Red Sea have good potentialities for fish exploitation, the insufficiency of modern fishing equipment and the lack of technical know-how have greatly retarded the possible development of fish economy in Ethiopia. Also the potentials in the rivers, lakes and the Red Sea coast have not been completely surveyed. Obstacles for the development of the fishing besides the lack of equipment and vessels are due to an

underdeveloped market and a lack of organizations to help the small fisherman. At present, the greater part of the fish caught comes from the Red Sea while inland waters are still unexploited and used only for small scale fishing for the local population or not at all in areas where fish is considered a low status food."

The government plans to overcome these obstacles. The nation's first fish-exploiting project will soon begin in an inland lake to benefit the domestic market.

TANZANIA: Reports great potential for freshwater and marine fisheries, "which so far remain virtually unexploited."

LIBERIA: It has begun a pilot project to produce carp aided by the Oxford Committee for Famine Relief of the U.K. A private corporation, Mesufish, distributes saltwater fish to nearly all major population centers. The source is the offshore waters of Liberia and west Africa. After processing and freezing, it is distributed to cold-storage centers--"from whence it moves into retail channels, largely operated by local marketers. The result of this private initiative has been to make fish protein available throughout the country at prices lower than have been realized previously."

NIGERIA: The Federal Government has invited experts to study the potential of the fish industry in order to increase the eating of fish protein.

MIDEAST

The UN Report states: "In Cyprus, Iraq, Jordan, Kuwait, Malta, and Turkey, activities essentially similar to those already described for other parts of the world are in progress or planned."

ISRAEL: Research has produced practical results in controlling brackish water and freshwater algae that produce toxins lethal to pond fish. The work is continuing at the Hebrew University-Hadassah Medical School and the Fish Breeding Research Laboratory.

EUROPE

The Report continues: "France, the Netherlands, Norway, and the United Kingdom as well as Canada report constant efforts to improve their own fisheries and catches, although during recent years the Swedish fishing industry has tended to stagnate, mainly due to competition from inexpensive foreign-caught fish."

UNITED KINGDOM: Government laboratories conduct much sea-fisheries research "to help the fishing industry to catch fish efficiently and economically and, in collaboration with scientists of other countries, to provide the scientific basis for conservation measures to protect the stocks and ensure rational exploitation of the resources." There is research to develop techniques to rear artificially in tanks plaice, sole, turbot, oysters, clams, and prawns. It is too early to say whether this fish farming can become an economic or competitive source of food.

Good progress is reported in rearing young fish to marketable size in sea-loch enclosures and in warm water discharged from generating stations. A pilot-scale plant has been built to develop methods to mass-produce shellfish. Research is starting on river management to increase production of salmon, sea trout, and brown trout. The National Environment Research Council is investigating possible use of krill and unexploited Antarctic fish stocks as new protein source.

FRANCE: Sea resources are developed by intensifying traditional fishing, improving fishing techniques and methods of preservation, developing new methods of exploitation, creating new resources, and utilizing better fish-protein resources. Research on hydrobiology of freshwater fish and other living organisms is being expanded.

Both France and the United Kingdom reported their aid to developing nations, "particularly in education and training, catching ability, processing and distribution, fish culture and research." France aids the Ivory Coast, Malagasy, and Senegal. Le Centre Technique Forestier Tropical operates a UNDP project to train fishery personnel and conduct research in fish culture in Cameroon, Congo (Brazzaville), Gabon, and the Central African Republic.

PROTEIN FROM
UNCONVENTIONAL SOURCES

"If the protein problem is to be solved," says the UN Report, "use must be made of protein from new and unconventional as well as traditional sources; waste fish was at one

time widely used as a fertilizer; later on techniques were developed for preparing fish meal for use as animal feed, and more recently much effort has been devoted to refining methods of production so that now it is possible to produce a bland fish flour intended for human consumption which is usually called fish protein concentrate."

FISH PROTEIN CONCENTRATE (FPC)

Chile reported that it had "enthusiastically welcomed the offer made by FAO and UNICEF in 1956 to set up the first pilot plant in the world at Quintero to produce fish flour for human consumption." This followed laboratory tests with South African samples produced by refining products designed for feeding animals. Technical and administrative problems hampered progress, but finally Chile produced a fish flour. "Chilean and foreign research workers have pronounced it nontoxic, of high nutritive value, stable, easily digested and assimilated either directly or as a supplement to conventional foods and preparations."

Other countries followed Chile's example. And, in Chile since 1964, the government promoted and supported studies of ways to use the product. During the last 2 years, protein-rich mixtures have been developed and tested successfully on very young and school-age children. Trials are planned in rural communities, in cooperation with the food industry, to use the mixtures in the feeding programs of the National Health Service and the School Welfare Board. The estimated demand for these programs, compulsory by law, is much greater than the production capacity of even the most modern fish-flour plants in Chile. So the problem of putting the concentrates on the free market and keeping them from groups other than the children "is less acute than it is in other countries with different administrative and political structures and a different economic and social system."

The UN has surveyed possibility of commercial production in Chile and Brazil.

EL SALVADOR: A Panamanian Health Organization (PAHO) expert has advised the government that because the fishing industry is not being developed, the production of fish protein for human use is not likely in the near future.

PERU: Production is encouraged and research is under way: e.g., the use of stick-water in fish-meal factories.

URUGUAY: There is laboratory production of a powder made by drying a material produced by fermentation of ground fish with yeast and sugar. "This powder is hygienically prepared, stable, cheap and highly nutritious and has been tested successfully in feeding undernourished children." There are plans to produce the material in a pilot plant at the Fisheries Research Institute.

ETHIOPIA & SWEDEN: Together, they are trying to produce FPC for humans. In Massawa, on the Red Sea coast of northern Ethiopia, a modern fish-meal factory, originally a Bulgarian-Ethiopian venture, was built to produce fish meal for animal feeding. In Sweden, fish meal is used for animal feed, but production at the Ethiopian factory has stopped because of supply and marketing difficulties. Recently, the Ethiopian Ministry of Commerce and Industry asked Swedish private industry to study the possibility of using the existing fish-meal plant, vessels, and fish resources in the Massawa region to produce FPC. Possibly, the product might be used as an ingredient of supplementary mixtures for children or in feeding school children.

MOROCCO: The UN is helping Morocco redesign its FPC plant at Agadir and promote and market its products.

NIGERIA: A foreign company is studying the practicability of making FPC. It is afraid that the price may be too high for needy Nigerians.

TANZANIA & NETHERLANDS: An experimental factory to produce FPC has been built in Tanzania. The planners will try to manufacture a product people will accept. The Instituut voor Visserijprodukten T.N.O. of the Netherlands is helping. Tanzania reports the project hampered by lack of fishing gear. It has found that samples made from freshwater fish appear to be more acceptable than those from marine fish. One aim is to set up several pilot plants on Lakes Tanganyika and Victoria to produce about 10,000 tons. This would require 80% of the present fish catch and might stimulate industry.

A second aim is to manufacture high-protein food supplements with FPC for children. "This will require market research, recipe development, studies on consumer acceptance and methods of publicity and an appropriate team of research workers." A third plan is to study possibility of making marine FPC.

SOUTH KOREA: The production of FPC from waste fish might help improve the fisherman's income and stimulate the poorly developed fishing industry. The Department of Fisheries Processing of the Pusan Fisheries College is investigating the experimental production of FPC. This work is financed by the Ministry of Science and Technology.

THAILAND: A.I.D. of the U.S. and the Oceanic Development Corporation have approached the Thai government about the possibility of producing FPC.

SOUTH VIETNAM: It is not now considering production because fresh fish are insufficient to meet demand. But it is aware of the possibility of adding FPC to bread and using it in supplementary foods for children.

PAKISTAN: FPC is not made, but the government is aware of its usefulness.

TURKEY: Experiments are in progress.

FPC: EUROPE

France, Norway, the United Kingdom, Sweden, and the Netherlands "have considered the subject but report no positive development." The Soviet Union is working to enrich bread with FPC and also "the preparation mixtures of this concentrate with plant products."

CANADA: Production and large-scale marketing of FPC are unlikely within the next 3 years. Likely to continue are small-scale production for nutritional evaluation. "Full commercial scale production is likely to develop three to five years hence."

The UN Report concludes the FPC section with the statement that, for developing countries now, the necessary technology would make FPC expensive compared to more conventional protein sources.

WHAT UN IS DOING ABOUT PROTEIN PROBLEM

FAO recognizes that if a country's staple food is cassava, sago, or plantains, this will provide little protein. An important part of FAO's plan to aid developing regions is to supplement such crops by fish or rice or maize, which can be grown locally and are better proteins. FAO also helps to increase production of grain legumes, including soya beans. "However, regions unaccustomed in the use of these good sources of protein must be educated in their processing and consumption."

FAO is working to improve the contribution of the world's marine and freshwater fisheries to world protein supply. Its activities include "identifying and assessing new sources of fish; conserving fishery resources; and promoting the development of commercial fisheries with the object of catching, processing and distributing fish and fish products in acceptable form as widely as possible throughout the world."

FAO is investigating the harmful effects of pollution on marine and freshwater fishery resources and fishing. It is studying the great manmade lakes and reservoirs, especially in Africa, so they can be managed for greatest production.

FAO is helping to avoid waste. It is helping governments to develop the food processing and distribution industries. Codes of practice for fish and fishery products, and for freezing fish, are being developed. These will help prevent losses during storage and distribution.

The Protein Advisory Group (PAG) has prepared tentative processing and quality guidelines for developing high-grade standardized protein products from oil-seeds and fish. Its membership has been expanded to include experts in many specialties.

Asks Fuller Report in 2 Years

Although the 60 governments provided voluminous material, PAG asks that "a more complete report be prepared in two years' time to allow for the development of country replies and their analysis."

UNITED STATES

4 SCIENTISTS WILL LIVE AT 50-FOOT OCEAN FLOOR 60 DAYS

Early this year, 4 U.S. scientists will live and work on the ocean floor off the Virgin Islands for 60 days. The major purposes of the operation, called TEKTITE I, are to help determine the kind of worthwhile marine research scientists can conduct when placed in the sea--and to see how the scientists behave under the stress of a strange setting. The latter information would be useful also to space scientists.

TEKTITE I is a combined operation of the U.S. Navy, NASA, Department of the Interior, and the General Electric Co., builder of the underwater habitat to be used by the scientists. ('Tektites' are small minerals that have survived a blazing journey through space to land on earth or in the ocean.)

The Habitat

The ocean-floor home of the scientists, a pressurized laboratory, is 2 vertical structures 18 feet high and 12 feet in diameter. These are connected by a 4-foot-diameter tunnel. Each structure has 2 living compartments, one atop the other. Food will be carried down in the habitat. A lifeline linking it to shore will supply water and the breathing mixture of oxygen and nitrogen. Power and communications will be provided by separate cables.

The Scientists

The 4 scientists, all from Interior Department, are: Richard A. Waller, Conrad Mahnken, John Van Derwalker, and H. E. Clifton. They will be in voice communication with colleagues on land. Throughout the operation, behavioral scientists and doctors will watch the aquanauts-scientists through closed-circuit TV.

SOME INTERIOR DEPARTMENT GOALS

The Department of the Interior is represented in TEKTITE I by BCF, the Bureau of Sport Fisheries and Wildlife, Geological Survey, and the National Park Service (NPS).

The scientists will study phytoplankton, the microscopic plants that drift in ocean currents and are food for larger animals in the ocean's food chain. Water samples containing plankton will be pumped to the habitat from different depths in order to measure the biological richness of the area.

The zooplankton, microscopic animals that feed on phytoplankton and are themselves eaten by fish, also will be studied. The emphasis will be on their relationships to other marine life and to the reef area. Such plankton studies usually are conducted from a rolling ship by lowering sampling devices. Direct observations from the ocean floor should be better.

How Productive Is Marine Life?

The scientists will use different methods to measure production of marine life in ocean and reef areas to compare the relative advantages of these methods. The conventional estimate of productivity is based on measurements of the oxygen produced and consumed in a certain period. During TEKTITE I, special equipment will be used to entrap organisms and then measure their oxygen production and absorption of radioactive carbon (C^{14}). These studies may enable scientists to standardize methods and reduce the present variations in estimates of organic production in ocean waters.

Study Marine Organism Behavior

Most marine organisms act in characteristic patterns when foraging, mating, and fleeing predators. Greater knowledge of these activities would lead to better understanding of the life history of certain species; and, if commercial species were involved, to development of the best gear to catch them.

Early in the operation, spiny lobsters (source of 'lobster tails'), reef and predator fishes, and some mollusks will be tagged with sonic transmitters. Then the movements and habits of these species will be monitored on a small, portable, sonar device. Even if an animal secretes itself in a coral burrow 4 miles away, the device will be able to detect the signals. The tagged animals will be followed day and night. When a lobster is found,

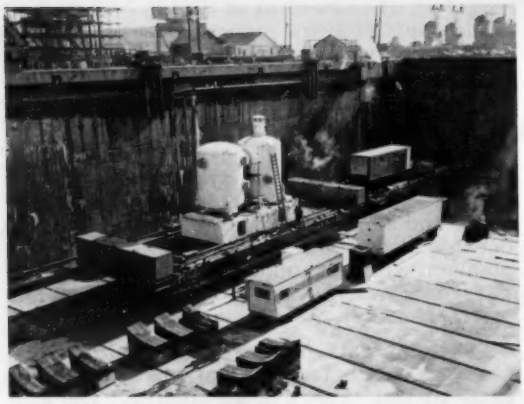


Fig. 1 - The TEKTITE I habitat undergoing systems tests in Philadelphia Naval Shipyard.

Fig. 3 - Interior view of quarters: bunks for the 4 aquanauts-scientists, entertainment console, and galley.

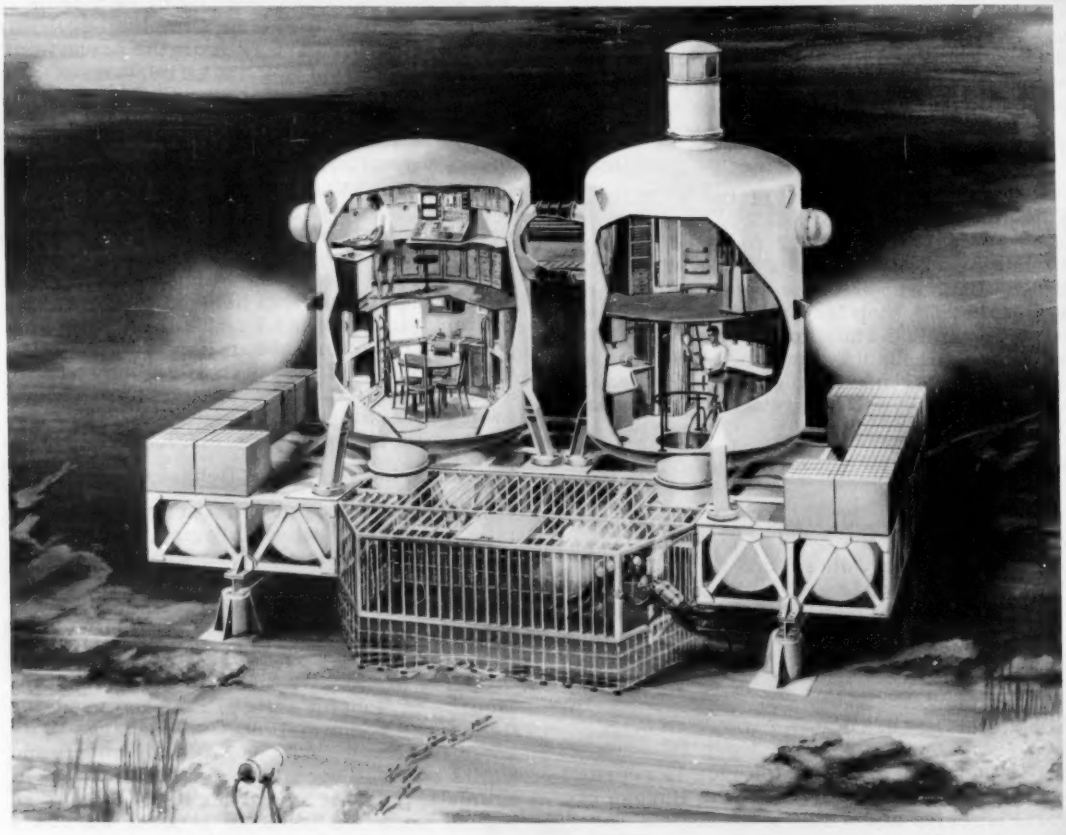


Fig. 2

the scientists will be able to determine its identity by a brand visible at night under ultraviolet light. When several representatives of a species are monitored, the scientists will accumulate information on "growth and survival, feeding habits, daily migrations, reproduction, responses to environmental changes," and other aspects of the species' life. Such observations are very difficult to make from the ocean surface.

Acoustical Studies

The increasing use of sonar in fishing makes it important to study its effectiveness in differentiating fish species--either by a characteristic signal return from one fish, or by signal recognition of swimming or schooling behavior of a group of fish. TEKTITE I will be an unique opportunity to identify sonar target species and correlate them with their acoustical "signatures."

TEKTITE SITE

The site of TEKTITE I is Beehive Cove in Greater Lameshur Bay, on the south shore of St. John Island in the Virgin Islands, about 900 miles southeast of Miami, Florida. The cove is in Virgin Islands National Park, administered by the National Park Service.

The water is very clear and warm, and tropical plant and animal life is abundant. The many coral reefs are home to vast reef-fish populations, spiny lobsters, and other marine life.

Fig. 4 - TEKTITE SITE. Aerial view of Greater Lameshur Bay off St. John Island in Virgin Islands National Park. (NPS: Fritz Henle)

First-Half 1968 Commercial Landings in Great Lakes Dropped

For the first 6 months of 1968, preliminary statistics from Michigan, Ohio, Pennsylvania, and Wisconsin show Great Lakes commercial landings of 32.3 million pounds; the figure for first-half 1967 was 41.3 million. This information is provided by the 8-state Great Lakes Commission.

BCF data showed 1967 landings for these states of about 78.5 million pounds--96% of the 8-state total for the lakes.

Ontario fishermen, who account for all of Canada's Great Lakes commercial catch, took nearly 20 million pounds in first-half 1968. It is a preliminary figure. The catch is 2.6 million pounds above the 1967 period.

1968 L. Michigan Catch

The first-half 1968 Lake Michigan catch by Michigan and Wisconsin commercial fishermen was 21 million pounds; it was 29.3 million in first-half 1967. The 1968 alewife catch was 12.5 million by the end of June.

Lake Erie

The 3 Lake Erie states reported first-half 1968 commercial landings of 7.8 million pounds, compared to the 1967 period's 8 million. Yellow perch landings, among the more valuable species, were 1.8 million pounds, 425,000 pounds more than in 1967. Whitebass catch was 500,000 pounds, only half the 1967 figure.

Lake Superior

The Michigan-Wisconsin catch in Lake Superior was 1,958,000 pounds, nearly 200,000 pounds below the mid-1967 figure; the decline in lake herring was responsible for about half this loss. The catch of valuable lake trout, protected in Lake Superior, was over 113,000 pounds by June 30.

In Wisconsin, the 1968 catch quota of 75,000 pounds of lake trout was the same as in 1967. The quota is set to gain biological data necessary to follow the lake trout's recovery. In Michigan waters, the 1967 quota of 145,000 was raised to 330,000 pounds for 1968.

Lake Huron

Through June, the Lake Huron catch in the Michigan part was a little under 1.5 million pounds, a drop of 50,000 pounds from 1967. Landings of yellow perch and chubs, most important to Huron's commercial fishermen, declined more sharply. The perch catch of 365,000 was 30% below the mid-1967 figure. Chub landings dropped 40% to 86,000 pounds.

Ontario's Great Lakes Waters

In Ontario's Great Lakes waters, the important factor in a 1968 gain was the increase in Lake Erie landings: from 14.1 in 1967 to 16.4 million pounds. Smelt catch rose from 4.6 to 7.2 million pounds; it made up losses for some other species, among them yellow perch. The decline in Lake Erie's perch harvest from 8.2 to 7.6 million pounds may be attributed to new controls aimed at problem of oversupply. Provincial authorities report perch abundant in the lake, and expect fishermen to have no trouble catching second-half 1968 quota. For the other lakes, Ontario commercial landings rose in all areas except Lake Huron.

Lake Trout Releases Approach 30 Million

The young hatchery-reared lake trout released in 1968 in lakes Superior and Michigan exceeded 5 million for the third straight year. Records of the Great Lakes Fishery Commission show the number released in Lake Superior since 1958 has reached 22.6 million; for Lake Michigan, where plantings began in 1965, the total is 7.3 million.

In 1968, plantings of lake trout in Superior were 3,481,000 yearlings; a half-million of these went into Canadian waters. In U.S. waters, plantings were made in about 20 locations. These extended from Minnesota's North Shore to Whitefish Bay at the lake's east end.

Lake Michigan's 1968 plantings of 1,876,000 lake trout were made at 16 dispersed locations, including several in the lake's southernmost section. As reference, the U.S.-Canadian fishery agency used a system of fin-clip identifications for the young fish to show time and place of planting.

Haddock Recruitment on Georges Bank Continues to Fall

The joint cruises of BCF's 'Albatross IV' and the Soviet research vessel 'Blesk,' completed in fall 1968, provided useful information on survival of the 1968 spawning of Georges Bank haddock. Again, the abundance index of young-of-the-year was nearly zero. This makes the fifth consecutive very poor year-class, an unusual situation. It spells bad news for the haddock fishery for at least 1969 and 1970.

1963 Class Losing Dominance

The 1963 year class, which in recent years has been supporting the fishery, soon will lose its dominant position. The abundance of haddock has fluctuated widely. The 1963-year class was the largest in history. But, as it reached marketable size in 1965 and 1966, it was fished hard. The Georges Bank population is suffering from that overfishing. There is a real possibility now of depleting the spawning stock.

Browns Bank

The Browns Bank situation is similar. However, because of the slower growth rate there, the 1963 year class will remain in the population 2 years longer.

Halibut Fishing Effort Declines

In 1968, U.S. and Canadian halibut vessels made only 1,286 trips. In 1967, the figure was 1,750 trips; in 1966, 1,965. The 1967 decline resulted largely from strikes in Canada, the 1968 decline from low prices.

Total 1968 landings reached only 49 million of the 58-million-pound quota. Average production per trip rose slightly from 31,000 pounds in 1966, to 32,000 in 1967, and to 38,000 in 1968.

Good Outlook for N. California Crab Season

Northern California crab fishermen again can expect a good season, reports the California Department of Fish and Game. The 1968/69 landings are expected to be between 9.5 and 11 million pounds. This would be below the preceding year's outstanding catch of 12.2 million pounds--but well above the 10-year average of 7.3 million pounds.

The northern season, covering Fort Bragg to Crescent City, opened December 1 and will continue through July 15, 1969.

Crabs Better & Heavier

Marine biologists of the Department's Shellfish Investigations have been sampling the commercial catch since 1964. This season's predicted catch is based on samplings during the first 10 days.

The crabs appear in slightly better condition this season. The average size of legal crabs is substantially larger than last season's. The average weight of crabs in the commercial catch up to the end of 1968 was 2 pounds, compared with 1.8 pounds last season.

Tuna Fleet Grows

In mid-November 1968, the new tuna purse seiner 'Marietta' sailed on her maiden voyage. Her 65-ton carrying capacity brings the fleet's total, including that of small bait boats, to about 46,000 short tons.

The aggregate capacity of all fleets in the eastern Pacific tuna fishery is about 55,400 tons. In 1968, the U. S. added 6,000 tons and the other countries the same amount.

Trend to Continue

The growth of the tuna fleet is likely to continue. The vessels now being built, or in planning stage, will add an average of more than 6,000 tons a year to U.S. fleet for the next 3 years.

Other nations plan to expand and modernize their fleets. And some nations, not now fishing the eastern tropical Pacific, are thinking of participating.

Battelle Reports Vaccine Effective Against A Salmon Disease

Scientists of the Battelle Memorial Institute report that an oral vaccine has been successful in the laboratory in preventing C. columnaris disease. The disease has been killing many salmon and steelhead in the Columbia and other rivers. Several years ago, C. columnaris virtually destroyed a sockeye salmon run on a tributary of Canada's Fraser River system.

The oral vaccine, which can be mixed with fish foods, was developed by M. P. Fujihara in Battelle's Richland, Wash., laboratory, and has been used to protect juvenile salmon.

Years of Work Ahead

Fujihara said: "The oral vaccination of juvenile salmon against columnaris has been successful under controlled laboratory conditions. However, successful application of the oral vaccine to large scale production hatchery use will require several years of continued study. Identification and thorough knowledge of the disease is necessarily the first step in developing practical solutions." Fujihara, a biological scientist, and R. L. Tramel, a technician, have used the fish's ability to develop antibodies against the columnaris pathogen as a new method of surveying fish to determine disease exposure. This survey technique is said to be a sensitive, more effective, way to survey for C. columnaris.

Survey Technique

Juvenile salmon were examined during downstream migration from spawning grounds to the ocean. Adult salmon were examined during migration from the Columbia's mouth to tributary spawning grounds in Washington and British Columbia. Blood serum and other samples were taken from hundreds of coho, sockeye, and spring and summer runs of chinook (king) salmon. After the samples were taken, the adult salmon were returned live to the river and tributaries. Similar blood-serum samples were taken from individual yearling rainbow trout in the laboratory once a week for 6 months without harming them.

Field investigations have shown that about one-third the juvenile sockeye salmon sampled had been exposed to the disease during downstream migration and while entering the ocean. Antibody production was observed in about 2½% of the adult sockeye sampled as they entered the Columbia's mouth.

Migration Hazards

"However," Fujihara noted, "both columnaris exposure and magnitude of antibody production increased during upstream migration until 70-100% exposure was observed on the spawning grounds." Some of the fish, on the upstream trip to spawning beds as far as 1,000 miles away, will be killed by "disease, exhaustion, predators, fishermen or barriers in the stream."

Studies have shown that population density and development of immune disease carrier fish (present in fish ladders) may be major source of disease exposure and infection during upstream migration.

Fujihara concluded: "This oral vaccine appears to be a practical and effective method for protecting young salmon against columnaris. If we could increase juvenile salmon immunity to columnaris to nearly 100 percent, more adults could make the return trip to their spawning grounds, or if we increase general survival by 10 percent, we could possibly double the number of adults which could return to the spawning grounds.

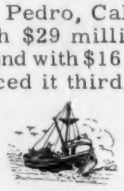
"Mixing this vaccine, and a vaccine against another salmon disease--furunculosis--into fish food may help control two of the main bacterial diseases of hatchery reared juvenile salmon. Columnaris vaccine incorporated into fish food could be extremely useful to State and Federal hatcheries which rear salmon."

Kodiak, Alaska, May Be No. 2 U.S. Fishing Port

Observers estimated in Nov. 1968 that the Port of Kodiak would have landings worth more than $15 million in 1968. The estimate was based on preliminary data compiled by the Kodiak office of Alaska's Department of Fish and Game. This would make Kodiak the second most important U.S. fishing port.

No. 3 in 1967

In 1967, San Pedro, Calif., was first with landings worth $29 million. New Bedford, Mass., was second with $16 million. Kodiak's $10 million placed it third.



Maryland Reports 1967 Was Record Year

The value of commercial fisheries products landed in 1967 was a record $16,912,898, reports Joseph H. Manning, Director, Maryland Department of Chesapeake Bay Affairs.

The value of manufactured fisheries products was estimated at more than $40,000,000.

Oysters led in landed values, 66% of total. Crabs were 14%; soft clams 9%; finfish 9%; hard clams and all other categories 1% each.

The Industry

About 9,000 fishermen--2/3 of them have no other employment--harvest Maryland's seafoods. About 6,500 boats and vessels harvest and transport the catch. The number of wholesale and manufacturing establishments has declined steadily: from 357 in 1957 to 285 in 1965. But the number of workers has remained "remarkably constant, never varying more than 209 from the mean of 4,355." The decrease in number of firms follows the general trend of consolidation in the food-processing industry. In the past 30 years, many small seafood processing plants were forced out because they were unable or unwilling to meet the costs of rising sanitation standards.

The seafood industry has recovered dramatically from the low point in 1963. Landings increased at a rate of $1.5 million a year.

Leads U.S. in Oysters

Maryland led the U.S. in oyster production during 1966 and 1967 "by a very substantial margin." Landed value of the 1967 harvest was $11,191,431, more than one-third the value of U.S. harvest.

Manning believes that Maryland's tidal waters are perhaps unmatched in the world as an environment for oyster growth. He warns, however, that the State's capacity to produce oysters is "not unlimited." The salinity range of Maryland's part of Chesapeake Bay is uninviting to starfish, one of the oyster's most effective predators; Maryland's tidal waters are troubled by boring snails only along the lower Eastern Shore. The oyster parasite 'Minchinia Nelsoni' (MSX) and 'Dermocystidium Marinum,' a marine fungus that probably kills more oysters in the U.S. than any other organism, are present in about one-third of State waters; they have caused many deaths. Occasionally, the Bay is hit by hurricanes. Storms like Hazel in 1954 do much damage. Throughout shellfish-producing waters, oysters must compete for space and food with many organisms. They are attacked by several predators. But the Maryland oyster has a much better chance to live to old age than oysters in most areas. The oyster's "normal" natural mortality rate is estimated at 10 to 15%.

State Help Since 1961

Since 1961, Maryland has invested annually about 1\frac{1}{3}$ million to restore productivity of the oyster resource. This had declined in almost a hundred years because of "overexploitation, neglect, and mismanagement."

This State effort has been based on (1) use for oyster cultch of centuries-old shell deposits buried in Chesapeake Bay, and (2) application of "farming" practices to management of the State's natural oyster bars.

Since 1961, 3 to 4 million bushels of dredged shells have been planted annually in the State's seed areas. Also, another 1 to 2 million bushels of dredged shells are planted to maintain "self-sustaining" natural oyster bars.

Manning projects a bright future for private oyster planters willing to invest in Maryland's efforts to remain the leading oyster-producing State. A 150% increase in production has not affected significantly the unit price received by public oystermen for their catch. It seems unlikely that oyster production in any other leading oyster State will increase during the next few years; in most, continuing decline is forecast.

Manning states: "We find no reason to believe that Maryland's private oyster fishery cannot undergo orderly developments without harm to the public fishery, and without abandonment of the time-honored concept that the natural oyster bars of the State are the common property of its citizens."

Coho Swim Over Willamette Falls in Record Numbers

Nearly 17,600 coho salmon, including 5,300 jacks, were counted over Willamette Falls in fall 1968. This doubled 1967's escapement and set a record, reported the Oregon Fish Commission.

Based on catch-to-escapement ratios, the record number over the Oregon City salmon barrier represented 36,000 more coho harvested by sport and commercial fishermen in 1968.

Of total escapement near the end of 1968, 94% chose the completed cul-de-sac part of the new fishway instead of the old, inadequate ladder. Early in the run, water levels were low and the coho chose the cul-de-sac because there was more attraction water. Later, as happened in previous years, water velocities over the old structure increased so passage became impossible. However, fish that used the cul-de-sac were not delayed. When the fishway is completed, no run will face the critical delays developing from extreme flows.

Increased Stocking

The 1968 record resulted from greater stocking efforts designed to develop the "tremendous natural potential of the Willamette system." From 1951-1960, the average annual juvenile coho release into the Willamette tributaries above the falls was less than 300,000. Since that period, juvenile coho releases rose to 6,500,000 a year.

Also, starting in 1964, the Fish Commission has transported and released around 7,000 adults each year into the Willamette system. The Oregon Game Commission and the U.S. Fish and Wildlife Service provided more trucks to help carry these surplus hatchery fish. These fish have become available only in recent years after the success of the Fish Commission's coho hatchery program.

The Commission notes the significance of coho returning to the Yamhill, South Santiam, Molalla, and the Mary's Rivers. In these rivers, coho runs never existed before the Commission's planting program.

Large Coho Runs Possible

Biologists estimate conservatively that the 1968 coho run in the Willamette can be tripled by natural production alone. The Fish Commission says that achievement of this potential depends on the fishway's completion. This is being paid for by Portland General Electric and the Bureau of Commercial Fisheries. Another factor is solving a serious downstream mortality problem at the falls' industrial complex that claims many young migrants.

The Fish Commission reported too that adult fall chinook counts, also double the 1967 count, had set a record.

DO YOU KNOW?

Lobster tag is not a game. BCF scientists think it is serious business. Recently, they "tagged" 2,000 lobsters off the coast of southern New England. They hope to learn more about the speed and extent of lobster movements, rate of growth, and the ages at which lobsters are most vulnerable to natural enemies other than man.

Harmless yellow plastic tags are attached to a lobster, and a reward is paid for each tag returned to BCF's Biological Laboratory at Boothbay Harbor, Maine. Although the tagging study has been underway only a short time, Bureau scientists have already learned that lobsters travel farther and faster than they had expected. One lobster covered 97 miles of ocean bottom in 27 days; another, an egg-bearing female, traveled 77 miles in 28 days.

--Catherine Criscione

U.S. FISHERMEN CATCH MANY TUNA OFF WEST AFRICA

The U.S. tuna catch off West Africa during the 1968 season was expected to total more than 10,000 tons of Atlantic yellowfin and skipjack. BCF reported that dockside value was expected to bring U.S. fishermen about $2.5 million.

Interest in the fishing grounds off West Africa was stimulated when 3 U.S. tuna boats, transferring operations from the Pacific to the eastern Atlantic during the second half of 1967, reported a catch of 1,500 tons.

In mid-June 1968, shortly after the yellowfin quota for the Pacific was reached, 8 tuna seiners, with carrying capacities of 450 to 1,000 tons, shifted to the eastern Atlantic. Fishing efficiency was increased by off-loading catches at Abidjan, Ivory Coast, and Tema, Ghana, for transshipment to the U.S. This enabled the seiners to return promptly to the tuna-rich Gulf of Guinea.

Assisted by R/V 'Undaunted'

Fishermen were assisted by BCF's research vessel Undaunted, which transmitted on-the-spot information about tuna school locations to the U.S. fleet. Undaunted is

assigned to BCF's Tropical Atlantic Biological Laboratory (TABL), Miami, Fla.

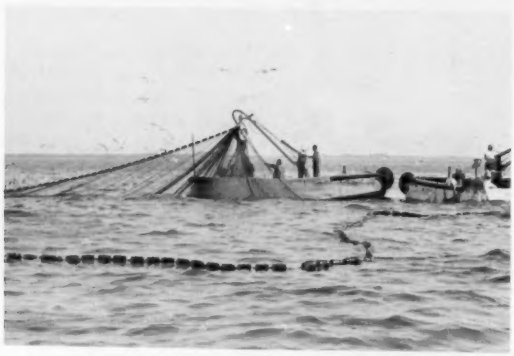
Much of TABL's program is devoted to gathering and interpreting fishery and oceanographic data on tuna in the tropical Atlantic. In cooperation with BCF's laboratory at La Jolla, Calif., U.S. fishing interests, and foreign scientists working in Africa, TABL personnel have compiled voluminous data on tuna stocks in the eastern Atlantic.

During 1968, TABL prepared "Tuna Purse Seining in West Africa, July-November," a guide for commercial fishermen planning to operate in the eastern Atlantic tuna fishery. It is a summary of information on tuna species, landings, fishing procedures, and favorable catch locations at specific times.

MENHADEN

In 1968, menhaden, which are converted into oil and fertilizer, or used as bait, made up nearly one-third of total U.S. landings of fish and shellfish.

The greatest catch increase occurred in the Gulf of Mexico. The Chesapeake and Middle Atlantic States followed.



Figs. 1 and 2 - Hauling in menhaden purse seine off North Carolina.

Fig. 3 - Flooding hold to unload menhaden catch.
(Photos: Bob Williams)

OCEANOGRAPHY

Scripps 'Washington' Is Studying Deep Ocean Off South America

The Scripps Institution of Oceanography's research vessel 'Thomas Washington' left San Diego, Calif., Dec. 9, 1968, on a 9-month biological, geophysical, and physical scientific exploration in the eastern Pacific Ocean. The first port of call of the 209-foot, 1,362-ton vessel was Antofogasta, Chile.

The 33,500-mile 'Piquero Expedition' will concentrate on the deep ocean off the west coast of South America, but it also will work on the continental shelf, according to Dr. Bruce A. Taft, cruise coordinator.

In Peru, piquero is the common name for the Peruvian Booby, the dominant bird of the Peru (Humboldt) Current. The bird's white head, neck, breast, and speckled back are distinctive.

Many Scientists Involved

During the Piquero's 9 legs, 130 scientists and technicians from the U.S. (including 16 Scripps graduate students), Chile, Peru, France, and the United Kingdom will conduct research.

Piquero is supported by the Office of Naval Research, Atomic Energy Commission, and the National Science Foundation.

Wide Study

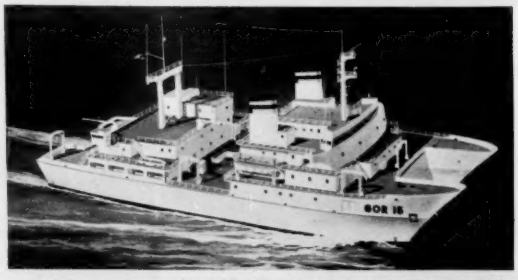
The investigations will include "an analysis of seawater samples for concentration of noble gases, such as xenon and helium, near the East Pacific Rise, a north-south underwater ridge on the eastern side of the Pacific; a major study of the physical oceanography of the Chile Current, including direct measurements of currents in the Drake Passage, between Cape Horn, Chile, and the Palmer Peninsula of Antarctica."

The scientists also will explore the relations among plankton, nutrient distribution, and currents west of Peru; a study of possible sea-floor spreading between the East Pacific Rise and the South American continent; and intensive study of animal and plant growth in upwelling water off Callao, Peru.

Between the Galapagos Islands and the mainland, the scientists will study the characteristics of the sharp boundary between the Peru Current's cold and salty waters and the warm and relatively fresh waters to the north. Also, they will study the circulation near the equator east and west of the Galapagos. The latter study will concentrate on determining the barrier effect of the Galapagos Islands on the flow of the subsurface Equatorial Undercurrent.

Navy Orders Unusual Oceanographic Ship

The U.S. Naval Ship Command System has awarded a $13.5-million contract to Todd Shipyards Corp.'s Seattle division to build the first of 9 oceanographic ships of a novel design.



Artist's conception of AGOR-16 Navy oceanographic research vessel (catamaran hull) being constructed for the U.S. Navy by Todd Shipyards Corporation, Seattle Division.

The prototype ship will become the Navy's first catamaran-style hull for oceanographic research. She will be 246 feet long, have a beam of 75 feet, displace 3,080 tons fully loaded, and travel at 15 knots. She will accommodate 25 scientists and a 44-man crew. Engineering work already has begun.

Foreign Fishing Off U.S. in November 1968

NORTHWEST ATLANTIC

92 Soviet, Polish, East and West German fishing and support vessels were sighted in early November; only 10 or 12 remained at month's end. The rapid decline may have been caused by 3 severe coastal storms in midmonth.

Soviet: Early in month, most vessels were 20 to 25 miles south of Martha's Vineyard; the rest were on Cultivator Shoals on Georges Bank. Moderate catches of herring were observed. After midmonth, there were only 5 to 7 vessels, scattered widely south from Block Island to Nantucket.

Polish: 19 vessels were sighted. 15 were south of Martha's Vineyard in early November; only 6 or 8 were left at month's end. Moderate catches of herring were observed.

East German: Early in month, 14 vessels were south of Martha's Vineyard; none was seen after mid-November.

West German: Some herring were observed on 17 vessels fishing along northern slopes of Georges Bank. None was sighted after midmonth.

MIDATLANTIC

Between 10 and 12 Soviet vessels were observed 45 to 55 miles southeast of Cape May, N.J., from November 10 to 22.

U.S. TERRITORIAL WATERS

On Nov. 13, during a fierce coastal storm with 100-mile-an-hour winds, some Polish vessels entered U.S. territorial waters without permission. About 10 inside 3-mile limit in Cape Cod Bay were not boarded because of hazardous sea conditions, but these were instructed to leave by sunset; 8 in territorial waters off Block Island and Martha's Vineyard were escorted outside 12-mile limit as winds diminished.

The Coast Guard boarded one vessel off Cape Cod and one off Block Island to advise that these vessels, and others, had failed to notify Coast Guard of entry into territorial waters. Both captains apologized. They said the storm had forced them to seek shelter. Neither had fished.

GULF OF MEXICO & SOUTH ATLANTIC

No sightings were reported.

OFF CALIFORNIA

In mid-November, 4 Soviet vessels were sighted around Channel Islands off Santa Barbara.

Fig. 1 - The refrigerated transport 'Saianskie Gory' off Anacapa Island in Santa Barbara Channel (northwest of Los Angeles, Calif.) on Nov. 18, 1968. The refrigerator, bought in Sweden in 1965, ervices vessels of Kamchatka Fisheries Adm. (Putnam, Calif. State Fish and Game Comm.)

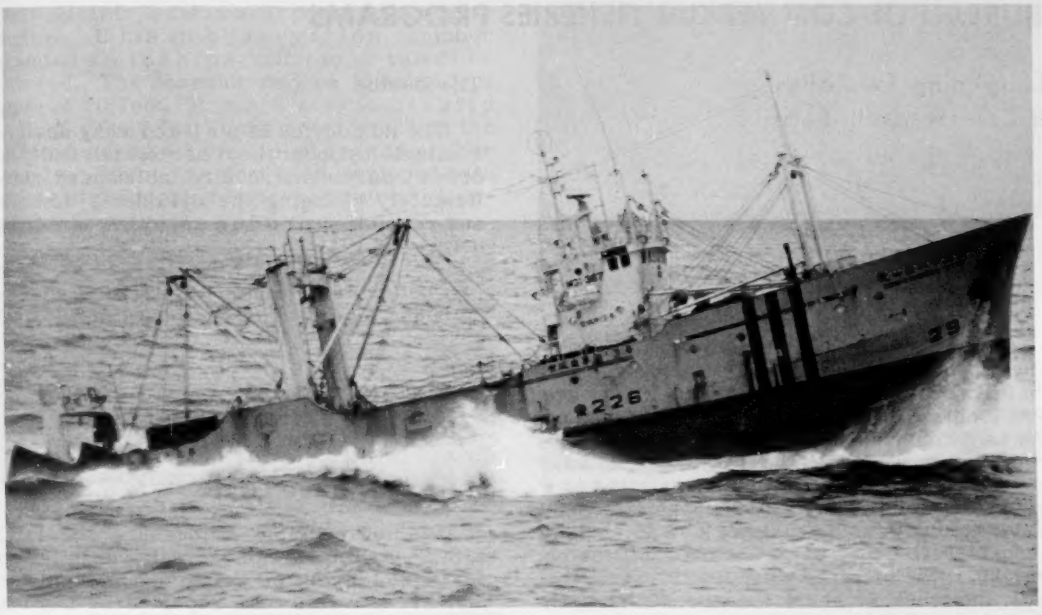


Fig. 2 - Japanese stern trawler underway in heavy swell in Bering Sea.

OFF WASHINGTON & OREGON

20 Soviet vessels, fishing rockfish and hake, were sighted off Oregon.

4 Japanese vessels were reported.

OFF ALASKA

Soviet: Around 30 to 34 vessels fished off Alaska in November 1968. About 16 to 19 fished ocean perch and other groundfish in the Gulf of Alaska; 3 continued ocean perch fishery along Aleutians.

11 medium trawlers--about half north of Fox Islands in eastern Aleutians, the other half along Continental Shelf edge in central Bering Sea--fished pollock, perch, gray cod, sablefish, and flatfish throughout month.

Japanese: About 40 vessels were sighted. In ocean perch fishery, 6 stern trawlers were in eastern Gulf, and 12-13 along Continental Shelf edge in eastern and central Bering Sea.

2 factoryships and 14 trawlers fished Alaska pollock and flatfish for fish-meal, oil, and minced-fish-meat fishery.

About 5 longliners caught sablefish in Gulf of Alaska.

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

Longlining Swordfish Is Commercially Feasible

BCF's research vessel 'David Starr Jordan' returned to San Diego, Calif., on Nov. 23, 1968, with more than a ton of swordfish caught on a 9-day cruise off Baja California. The crew and scientists were joined by 3 commercial fishermen interested in longline fishing for broadbill swordfish.

Cruise Leader Susumu Kato of BCF Fishery-Oceanography Center, La Jolla, explained that the cruise's primary mission was to see how longline fishing, a successful method on the east coast but not used by California fishermen, compares with the traditional harpoon method. Five separate sets consisting of 6 miles of mainline with 400 hooks attached, and baited with squid or mackerel, caught zero to 9 fish per set. The broadbill catch was 20. Two of these were lost: one at the rail, the other by shark damage. Other fish landed included dolphin fish, species of shark, pelagic stingrays, and a turtle.

Fall-Winter Fishery

The cruise results indicate that the catch rate using longline gear is high enough to support a fishery during the late fall and winter when the harpoon fishery is over. Commercial fishing would require more hooks. If adopted, the methods developed by BCF should allow 4 or 5 men to handle daily 15 miles of mainline and 1,000 hooks.

New Device Controls Depth of Fishing Equipment

A depth-controller developed recently for BCF can regulate exactly the depth at which underwater fishing gear will be placed. The depth-controller was fashioned to provide quick, precise, remote control of midwater trawls and other towed gear. A patent was granted Mt. Auburn Research Associates, Inc., Cambridge, Mass. (Serial No. 3,404,655.)

The Device

The new device is a specially designed rotatable cylinder, kept horizontal, and powered by an internal, controllable speed motor. Remotely changing the cylinder's direction and revolution produces either upward or downward lift.

Underwater equipment and fishing gear can be put in place by the cylinders at the depth desired while in operating position.

Sonar Measures Size of Fish Schools in Upper Mixed Layer

It is now possible to measure accurately with sonar the size of fish schools in the upper mixed layers as a ship proceeds at normal speed. This was reported by Dr. Paul Smith, BCF La Jolla, leader of Cruise No. 30 of the 'David Starr Jordan' in the Channel Islands area in fall 1968.

In the past, fish schools at depth have been measured at ship's speed, but Cruise 30 offered the first opportunity to do it in the surface layer. Measurements were taken where high concentrations of anchovy schools had been found.

The Jordan's Sonar

The Jordan's sonar measures the width of fish schools using a receiver control that changes the gain level according to the loss of acoustic power with range in sea water. This control accounts for the divergence of sound waves and the weakening of the sound at each frequency.

Underwater Observation Vehicle Used to Study Fish

Dr. J.R. Hunter, BCF La Jolla, has checked out the underwater observation vehicle 'Sea-See' to see whether it can be used in field studies of the behavior of pelagic-fish schools.

The vehicle is a catamaran powered by diesel engines. It has an observation chamber mounted amidships that can be raised or lowered. The chamber may be lowered to a depth of 10 feet. It has 2 acrylic plastic hemispheres 6 feet in diameter joined by the entrance tube 3 feet in diameter. The chamber, which can seat 2, is equipped with underwater listening devices and other equipment.

Fig. 1 - Sea-See searching for dolphins off California. Vehicle offers 'virtually unrestricted' view of marine mammals and fish. Here, Sea-See is above water with viewing chamber submerged. The chamber is raised and lowered from central platform around which people are grouped. (Official photographs U.S. Navy)

Fig. 2 - The octagonal underwater viewing chamber.

Fig. 3 - Dolphins photographed from observation capsule.

Jack Mackerel Schools Observed

The Sea-See made three 1-day trips near the Isthmus of Catalina Island. Jack mackerel schools were located on 2 of the 3. Underwater observations were made and photos taken of the schools. Some of the stereophotos taken during the day were good enough for making estimates of interfish distances; these will be compared with measurements made in the La Jolla lab.

Feeding

The schools of about 500 individuals (60-82 mm SL) remained at 5 to 25 feet. Fish fed through the day. Feeding frequencies ranged from 0 in a 1.17-min. interval to 29 feeding snaps in a 0.31-min. interval; the median frequency was 14 snaps per minute. Stomach contents of 4 feeding fish were taken and all were full. One stomach was examined. It contained 1,454 food items; 88% were copepods of 4 genera.

"This preliminary experiment demonstrated that feeding experiments incorporating behavioral observations can be conducted in the field on a pelagic marine fish."

Strobe Photos

Strobe photos were taken at night where schools had been observed during the day. The purpose was to determine if jack mackerel schools continued to school at night. Photos were taken at 1-minute intervals from 5:30-6 p.m. Jack mackerel schools were in many photos. The latest in the evening these schools were photographed was 5:57 p.m., about 8 minutes after end of nautical twilight. The sky was clear but moonless.

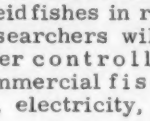
"These observations confirmed laboratory findings that jack mackerel are able to school near the surface on a clear moonless night."

Pascagoula Is Building Seawater Lab

BCF's Pascagoula (Miss.) Exploratory Fishing and Gear Research Base is constructing a closed-system seawater laboratory. It will contain an 18-foot-diameter circular pool, a 15-foot rectangular tank, smaller holding tanks, and many aquaria. A saltwater well will provide the water.

Lab's Function

The lab will be used to investigate the behavior of clupeid fishes in relation to fishing gear. The researchers will determine reactions, under controlled conditions, of potentially commercial fishes to artificial stimuli: light, electricity, barriers, and sound.



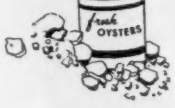
New Package Protects Oysters in Transit

BCF's Seattle (Wash.) Technological Laboratory cooperated with a major oyster cooperative and a container manufacturer to develop a package that will protect fresh oysters from temperature changes during transit.

The shipper wanted to pack 200 pounds of mixed 12-ounce retail cans and 4-lb. institutional cans in the same container. The researchers found that an ordinary telescoping fiberboard container--packed with prechilled oysters and topped with 12 pounds of dry ice--worked well.

Good Results

At an average ambient temperature of 75° F., the temperature of the product did not exceed 45° F. during a 24-hour period. The shipper reported "excellent results." Some shipments arrived at temperatures close to 32° F. Before the new packaging was used, shipments often arrived in poor condition because of excessively high temperatures.



DESTRUCTIVE MARINE ORGANISMS

Mollusks and crustaceans which attack soft rocks, sandstone, and wood are the most destructive of marine organisms. Some have been known to burrow through a lead submarine cable sheeting.

The Teredo (or shipworm), a mollusk that bores into wood for shelter and food, is the worst problem. It enters submerged wooden structures as a larva and grows rapidly to full size (4 to 10 inches long, $\frac{3}{16}$ to $\frac{1}{4}$ inch in diameter).

The Teredo long has been recognized as destructive. Few kinds of wood can withstand its attack. The heartwood of greenheart, a tropical tree, is the only timber that stands up reasonably well around the world. Teak is generally impervious to the Teredo, but is very susceptible in some areas.

There have been many schemes for exterminating the Teredo in infested wooden ships--the most effective is an occasional change of ports. Apparently, the Teredo can live only in water of more than 0.5 percent salt content, and at temperatures ranging between 30° F. and 100° F. The shipworm will die if an infested ship is in fresh water for several days, or beached during cold weather. ("Industrial Bulletin," Arthur D. Little, Inc.).

Fish Oil Research at Seattle Technology Laboratory

Fish oils represent only a small portion of the total U.S. fats and oils market, but they are a significant part of the industrial fishing industry. These oils have been items of commerce for many years. They have been sold on the basis of their general properties as low-priced substitutes for animal and vegetable fats. Over a period of many years, they have become known as a low-quality, inexpensive commodity. The situation still exists today. Before their domestic use in foods was prohibited in the 1930's, a considerable amount of fish oils was manufactured into margarine and shortening. Since then, they have been used as industrial products only. However, about 60 percent of the domestic production of fish oil is exported for manufacture into edible products.

As cheap synthetic and petrochemical compounds began to find their way into areas of industrial application once enjoyed by natural fats and oils, BCF started a research program in 1952 at the Technology Laboratory, Seattle, Wash., to develop new uses for fish oils. Studies of the chemical and physical properties of fish oils were emphasized. Considerable information regarding the characteristics of fish oils was gained. Many new derivatives of fish oils with a wide range of potential applications were prepared.

Research Scope Broadened

The objectives of the program were recently reviewed and the scope of research was broadened. The reason was the development within BCF of a process for manufacturing fish protein concentrate (FPC) that produces potentially high-quality oil as a byproduct. The fish oil research program now includes studies on methods of upgrading the quality of fish oil from FPC processes. The results indicate that the oil is superior in quality to commercial fish oil. The oil from FPC processes should be a good raw material for further refining to a food-grade product, or it can be used as a high-grade raw material for industrial purposes. Use of this oil in food depends on approval by the U.S. Food and Drug Administration.

Several variables that can determine the quality of the final product are being investigated. These include quality changes of the raw material under various holding conditions prior to extraction, and their effects on the final oil; solvent contact time and temperature during extraction; efficiency of solvents in separating the oil from the protein; and recovery of triglycerides free from other lipids and lipid-associated compounds that give rise to undesirable characteristics in fish oils. In studying these problems, the extraction process must not adversely affect the quality of the oil or the protein concentrate, and the economics of the process must be maintained. At the point where a satisfactory product is recovered from an FPC process that can be further refined to meet the requirements of an edible oil, studies on the oxidative stabilization of the oil will begin. This phase will be critically important if an edible-grade fish oil is to be utilized with the polyunsaturation intact.

Edible Fish Oil Uses

Undoubtedly the initial, and probably greatest, application of edible fish oil in the U.S. will be in the margarine and shortening industries. For these purposes, the oil will be hardened by partial hydrogenation. This will also increase the stability of the product toward oxidation. There are other areas where fish oil can be used by the food industry as liquid or solid fats. Also to be considered is the use of fatty derivatives of edible oils as industrial products and as food additives. Research is in progress to prepare surface-active agents that offer special functional properties when incorporated into food or industrial products. Samples of mixed mono- and diglycerides made from fish oils have been distributed to interested segments of the food industry for evaluation as emulsifiers in their products. If the evaluations show promising results, such compounds would enter into competition with similar compounds prepared from edible vegetable and animal fats. The market for this type of emulsifier in the U.S. amounted to 120 million pounds worth $30 million in 1965.

Future investigations will involve more research on fatty derivatives as food additives and industrial chemical intermediates, as well as evaluation of fish oil triglycerides as food fats. Other research subjects are the non-triglyceride lipids and lipid-associated materials that can be separated and recovered from fish oils. The investigations would focus on their potential in food, industrial, and pharmaceutical applications.

--Erich J. Gauglitz Jr., Research Chemist
BCF Technological Laboratory, Seattle, Wash.

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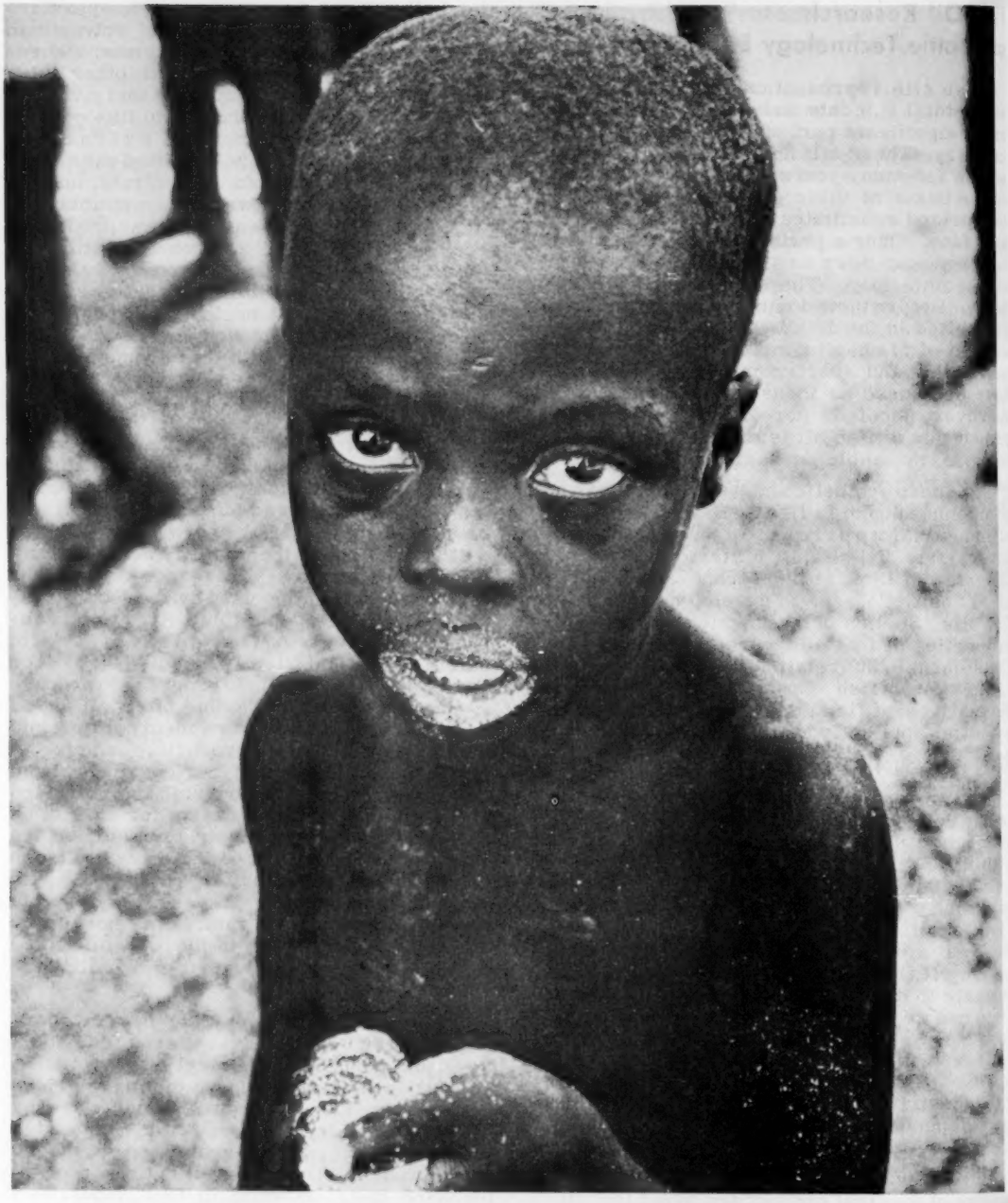

This African boy was so hungry that he could not wait for the flour to be baked. The flour was provided by the UN's Food and Agriculture Organization.

For him--and for hundreds of millions of other children around the world who go to bed hungry every night--fish protein concentrate may ensure a better tomorrow.

THE U.S. FISH PROTEIN CONCENTRATE PROGRAM

Roland Finch

The population explosion has led to worldwide nutrition problems. Food production has not kept pace with the rapidly increasing population. Many people, especially in less-developed countries, get less and less to eat every year. Not only is the amount of daily food insufficient, but the quality often is below that needed for proper growth and for leading a full and useful life. In many countries the average diet is low in protein--important in the formation of brain and muscle during the growing process. This affects especially babies and young children, and nursing and pregnant mothers. Protein deficiency has been shown to cause stunted growth and underdeveloped mental capabilities. In extreme cases, it leads to an illness called Kwashiorkor, especially serious in young children, and sometimes it leads to death. Terrible and dramatic evidence of this has been widely published recently in accounts of starvation in Biafra, but it is often not realized that such protein shortage is a daily fact of life in many parts of the world.

A great improvement could be made if more protein were added to the food of undernourished people. This would be especially valuable if the addition could take the form of animal protein. This is not only a very efficient form of protein in itself, but it also has the advantage of increasing the value of the vegetable protein in the food to which it is added.

Nutritionists concerned with the problem have considered many sources of protein. One of the best is fish, which contains 15 to 20 percent of a high-quality animal protein. There is evidence to show that the oceans of the world could provide much more fish than the 60 million tons now harvested each year, and some scientists believe four times as much. Just one-tenth the amount presently unused would, by this estimate, be 18 million tons of fish. This could provide about two ounces of fish containing one-third of an ounce of fish protein daily to the more than 750 million people believed to receive now insufficient protein. Two ounces of fish would not give all the protein needed each day--but would be enough, with the vegetable protein already eaten, to produce marked improvement in a typical protein-deficient diet. Therefore, increasing the world production of fish would seem to be a good way to meet at least a large part of this problem. The difficulty is that fish are often expensive and will only keep for a short time after being caught, especially in the tropics. Less developed countries cannot afford to instal and operate extensive systems of refrigerators, containers, freezers, and transport. In these countries, fish cannot be stored for long or shipped far from the coast. So even if more fish were landed, many people still would be unable to benefit.

Mr. Finch is Director, FPC Project, BCF.

FISH PROTEIN CONCENTRATE (FPC): THE CONCEPT

Scientists studied the problem of how to 'stabilize' fish inexpensively so the fish could be stored and shipped without refrigeration. They found that if the water and oil were removed, the remaining product would be largely protein. They called the product fish protein concentrate, or FPC. When properly made, FPC will keep for long periods without being canned, frozen, or otherwise specially treated. There are several ways oil and water can be extracted from fish, and BCF chemists examined these. They decided that one of the simplest and cheapest was to grind up the whole fish and extract the water and oil with isopropyl alcohol--an inexpensive, safe, solvent.

The dried product was a tasteless, odorless powder containing more than 75 percent protein. It could be added to many foods, such as bread, cookies, pasta, tortillas, soups, etc., at a 5- to 10-percent level without affecting appreciably the appearance and flavor. The foods containing FPC looked and tasted almost the same as those without, but the amount and quality of the protein were greatly increased.

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The next question was the safety of the process. Did the process have any undesirable effects? Extensive chemical and feeding tests using FPC made from hake, first on animals and then on humans, showed FPC to be highly nutritious, as predicted, and free from any side effects. The National Academy of Sciences and the U.S. Food and Drug Administration reviewed the results of these tests and proclaimed FPC wholesome and nutritious.

THE PRACTICAL DEVELOPMENT STAGE

So far, FPC was only a laboratory product. Before it could become a practical reality, it was necessary to determine whether it could be made economically on a large scale. Scientists and engineers at BCF's College Park (Md.) Laboratory, using a model-scale unit, studied the technical problems and developed much basic information needed for larger-scale operation. At this point, BCF hoped that industry would take up the process. But, at meetings and privately, industry representatives said they did not believe sufficient information was yet available to be sure operation on a commercial scale was practical.

Members of the Marine Protein Resource Development Committee of the National Academy of Sciences, who were advising BCF, were concerned about this delay in developing a commercial FPC operation. They recommended that BCF construct a demonstration plant to develop the large-scale application of the process and to prove its feasibility. The plant would give reliable engineering and cost information needed by would-be investors. It also would provide considerable amounts of FPC to the U.S. industry and to the State Department's Agency for International Development (A.I.D.) to explore the best uses of FPC in many countries. And the plant would form a working demonstration center for the U.S. industry and foreign visitors. Several Congressmen became interested in the project. Bills were introduced to construct or lease varying numbers of plants. Different ideas were resolved. In November 1967, Public Law 89-701 authorized funds for BCF to construct an experimental and demonstration plant, to lease another, and to conduct necessary research. When BCF called for bids to construct and operate a plant that would process 50 tons of fish daily, it was found that the $1 million authorized was insufficient. It was hoped that an interested company might make up the difference in cost in return for the opportunity to be first. This did not happen. It became necessary to request Congress to increase the construction authorization. After considerable discussion, the existing law was modified to permit use of part of the funds already authorized for other purposes of the act for construction. In this way, it became possible to construct the plant without increasing the total amount to be spent.

THE FPC DEMONSTRATION PROGRAM

During this time, BCF had been negotiating with bidders to design, construct, and operate the proposed plant. It was considered important that the successful bidder be responsible for all these aspects of the program. On October 21, 1968, a contract was awarded to Ocean Harvesters, Inc., of Los Angeles, Calif. One subsidiary company, SWECO (formerly Southwestern Engineering Co.) will undertake design and construction. The other, Starkist Foods, Inc. (associated with H. J. Heinz Co.) will operate the completed plant.

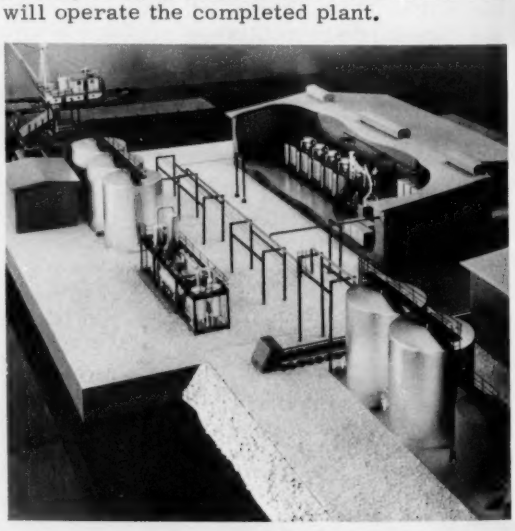


Fig. 1 - Scale model of BCF's FPC Pilot-Demonstration Plant to be built and operated by Ocean Harvesters, Inc., in Grays Harbor, Aberdeen, Wash. When completed, the plant will convert about 50 tons of raw fish a day into 8 tons of FPC.

The first 5 months will be occupied with predesign engineering studies to determine and demonstrate design factors needed in several stages of the operation--raw-fish grinding, deboning, extraction, drying, solvent removal, milling, and recovery of the solvent. Based upon this work, and on results

previously obtained by BCF, a process design will be developed. This amounts to a series of flow sheets that will show exactly the types and sizes of equipment needed, and the flows and balances of materials at each stage. The next step will be plant design, an architectural plan showing dimensions and locations of equipment and building. Figure 1 shows one proposal for the layout, although the final design will not be completed for months. Following design approval, the plant will be constructed at Aberdeen, Wash., on land generously made available by the Port of Grays Harbor. The first start-up operation is due in March 1970. Two months later, after the initial shakedown, the plant will be examined, approved, and accepted by the Government. Ocean Harvesters will continue to operate the plant for 10 months more under the present contract.

THE PROCESS

A simplified outline of the process is shown in Figure 2. The plant will be designed to extract the groundfish with alcohol in stages. To achieve greatest efficiency, it will be a countercurrent system: the alcohol will travel through the stages in the opposite way to the fish. In each stage, the fish (sometimes partly extracted) will be mixed in a large tank with the solvent for a time, then separated. The extracted fish will pass to the next stage--and the solvent will pass in the reverse direction to an earlier stage. The later stages will probably be heated to increase the extraction of oil. The final moist cake of extracted fish will be dried so that most of the isopropyl alcohol can be recovered and reused. A very small amount of remaining alcohol cannot be removed by simple drying and must be driven off by treatment with steam. This process will also remove traces of fishy flavor which may be left in the product. Following this, the dry product will be ground to a very fine powder and filled into 50-pound bags for storage.

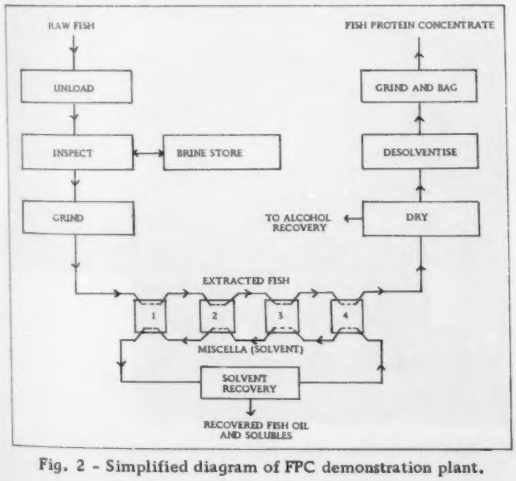


Fig. 2 - Simplified diagram of FPC demonstration plant.

The plant will be able to process about 2 tons of fish per hour; this will produce slightly less than one-third ton of FPC. Because it is an experimental plant, it will be run mostly on an 8-hour basis, not continuously as would be necessary in a production operation. However, there will be some periods of continuous running to check the equipment's efficiency under these conditions. A control group of BCF employes will occupy a laboratory in the plant to examine the raw fish, control and measure the product quality, and to collect engineering and other data required for future designs and cost calculations.

THE FISH

The fish used for the first operations will be Pacific hake because only hake and hakelike species can be used for making FPC at present. Data are being collected to further petition the Food and Drug Administration to increase the number of species that may be used to make FPC. So other fish will be used for later runs in the plant to find out what changes, if any, are needed in design and operation to use the plant for different species, especially fatty fish. The use of fatty species, such as menhaden, anchovy, herring and thread herring, has a potential for making FPC at a lower cost than when hake is used. In many parts of the world, they can be landed for less money.

Moreover, experiments have shown it probable that natural oil these species contain in larger amounts can be recovered very cheaply in excellent condition. The oil can be sold to offset the cost of FPC.

Another byproduct is fish solubles, a mixture of soluble proteins, salts, and other compounds used to a limited extent in animal feeding. At present, this is not a high-value material and would not contribute much revenue to the operation.

(Contd. p. 30)

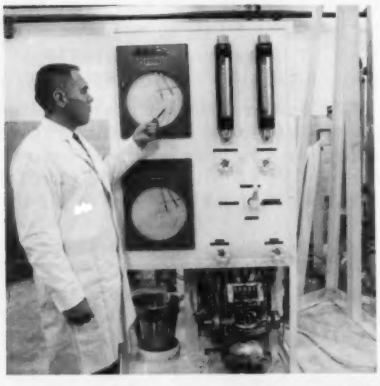
HOW BCF MADE FPC

GRINDING FISH: Operator drops hake into grinder, which produces . . . . .

. . . . . a FISHBURGER.

Fishburger is mixed with alcohol in unheated vessel to remove water and fats (they dissolve in alcohol).

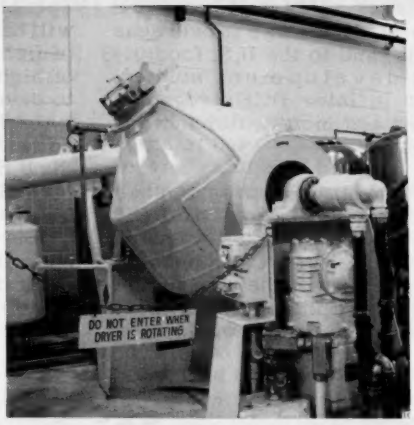
HOT ALCOHOL is used to continue the extraction of fats and moisture from the fish.



Processing of fish is conducted under carefully controlled conditions of time, temperature, and the completeness of each operation.

SEPARATION of solids, which drop into container, from liquids.

DISTILLATION COLUMN recovers alcohol, which is used again.



ROTATING VACUUM DRYER removes virtually all traces of the solvent (alcohol).

FPC

FINE GRINDER reduces fully dried FPC to particle size desired. It is bagged and marked to indicate the different experimental conditions under which it was produced.

All these foods contain FPC.

The FPC made during this demonstration will be available to A.I.D. for use in overseas feeding programs, and to the U.S. food industry for market-development studies. Some will be used in later BCF programs designed to find new and more efficient ways of applying it to foods.

Even when the demonstration program has proved the isopropyl-alcohol method and provided the data needed by industry, much will remain to be done before FPC can become a practical, working reality on the great scale necessary. It will require private investment and industrial experience to develop and operate full-scale production plants. These will have to be capable of processing 200 tons of fish or more daily, and ensuring a supply of high-quality product. Much must be done to develop markets for FPC, by investigating ways it can be fed to protein-deficient people. Some work already is being undertaken by the U.S. food industry and in studies conducted for A.I.D.

But the stage now is set for moving FPC from the laboratory to a full practical demonstration--an important step in bringing fish protein to needy people throughout the world.

DO YOU KNOW?

The scallop shell was the emblem of knights and monks of the Crusades in the ninth and tenth centuries.

Found in the coats-of-arms of many noble European families, the scallop shell may indicate that the bearer's ancestors went on a holy pilgrimage to the shrine of St. James the fisherman in Spain, to the Holy Land, or on a long sea voyage.

The scallop, long a favorite symbol of both writers and painters, appears frequently in literature, song and art. It is mentioned in the works of both the Elizabethan gallant, Sir Walter Raleigh, and the still-popular Sir Walter Scott. Because of its beauty of shape and color, the scallop was represented so often in portraits of the mythical Venus that the name "Venus-cocle" came into common usage in Old English.

The Makah Indians of the U.S. Pacific Northwest used scallop shell rattles in their ceremonial dances. One particularly beautiful specimen of Pacific scallop was an object of worship by natives of some South Pacific islands before the introduction of Christianity.

An oversized muscle called the "eye" enables the scallop to move through the waters and over the ocean floor by snapping its shell together. This nutritious, sweet-flavored muscle is relished by gourmets for its delicate flavor.

BCF conducts research programs on both the giant sea scallop of the North Atlantic and the small calico scallop of the South Atlantic to assure a continued supply of these tasty shellfish for U.S. tables.

--Catherine Criscione

A MACHINE FOR WINDING TRAWL CABLE

Ian E. Ellis

An inexpensive device was developed to facilitate the frequent transfer of steel trawl cable between fishing vessel winches and storage reels. It has three components: reel lifter-stand, axle, and drive unit. The device can be readily transported because it is compact and weighs about 250 pounds.

The reel lifter-stand (Fig. 1) has two frames of schedule No. 40 steel tubing, galvanized after fabrication, and two bearings. The stiffener atop the handle is a 30-inch piece of $\frac{1}{4}$-inch steel plate, which tapers from 1 to 2 inches wide. The bearings are removable and easily replaced. A 2-inch piece of 4-inch outside diameter tube is machined to $2\frac{7}{8}$-inch inside diameter to mate with the bearing surface of the axle. The tubing is then sawed longitudinally to give two semicircular bearings, and each bearing is welded to an 18-inch stem of $1\frac{1}{2}$-inch pipe. The bearing stem is dropped into the riser, open upper end of the lifter-stand. Height of the axle may be adjusted by inserting a pin into holes in the lifter stand.

The axle (Fig. 2) is a 5-foot piece of $2\frac{1}{2}$-inch schedule No. 80 tubing with bearing surfaces machined near the ends. A flange is welded on one end and a drive sprocket bolted to the inside of the flange. The drive arm is a 12-inch piece of 1- by 2-inch steel channel with a slot, butt welded to the axle 7 inches from the sprocket. The slot in the drive arm permits the attachment of different steel reels to the arm by a $\frac{1}{2}$-inch machine bolt. A

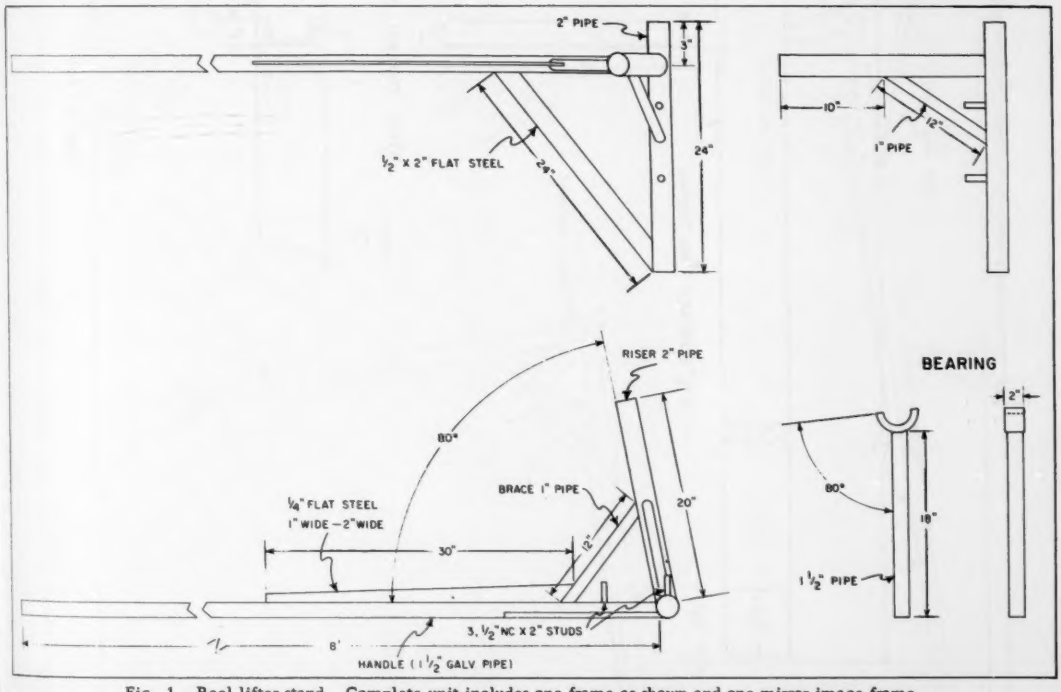


Fig. 1 - Reel lifter stand. Complete unit includes one frame as shown and one mirror image frame.

The author is a Fishery Methods and Equipment Specialist, Exploratory Fishing and Gear Research Base, BCF, 2725 Montlake Blvd. E., Seattle, Wash. 98102.

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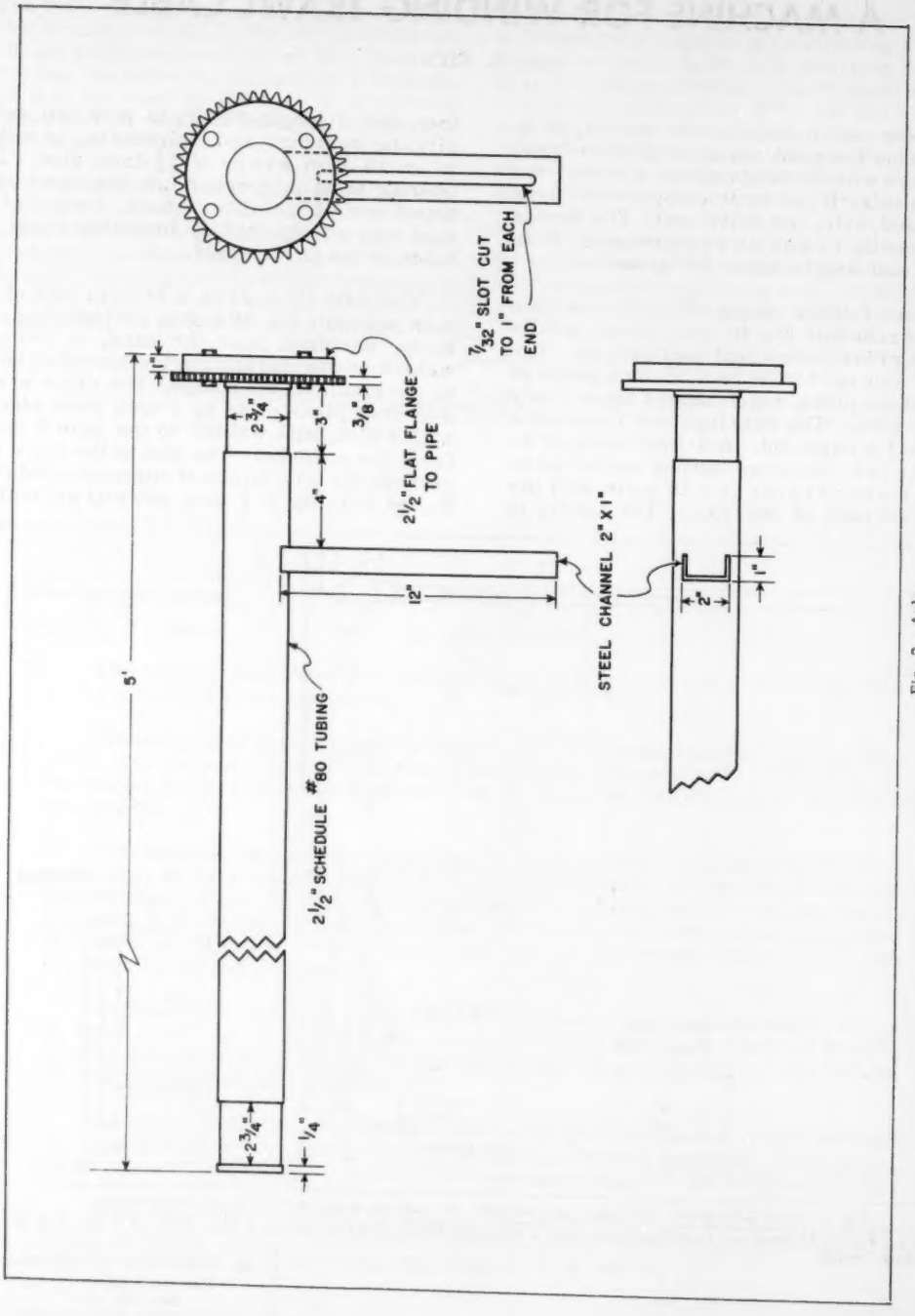

7/32" SLOT CUT TO 1" FROM EACH END
1"
2 3/4"
3"
3/8"
2 1/2" FLAT FLANGE TO PIPE
4"
12"
STEEL CHANNEL 2" X 1"
2"
1"
5'
2 1/2" SCHEDULE #80 TUBING
2 3/4"
1/4"

Fig. 2 - Axle.

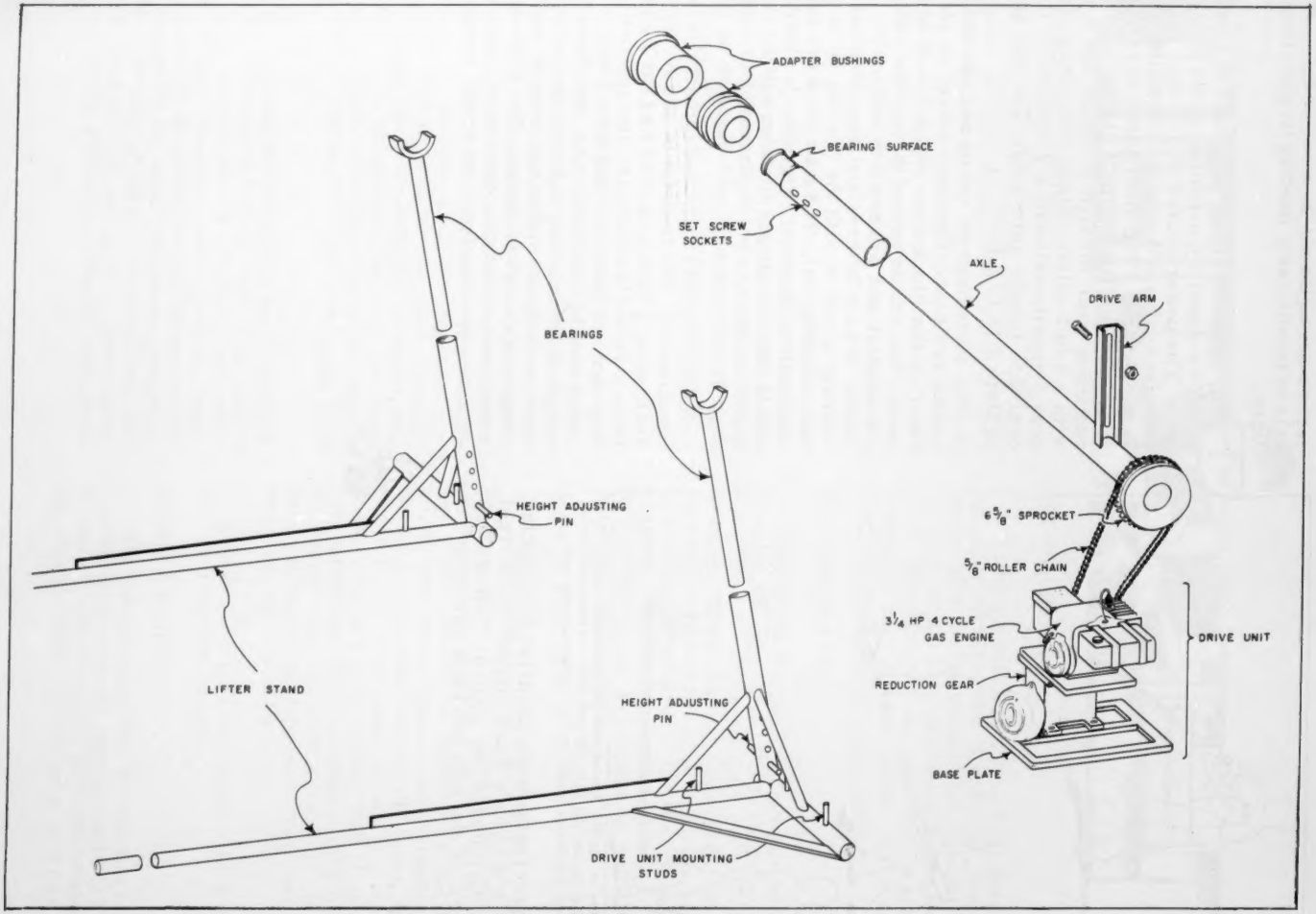


Fig. 3 - Complete assembly for winding cable, exploded view.

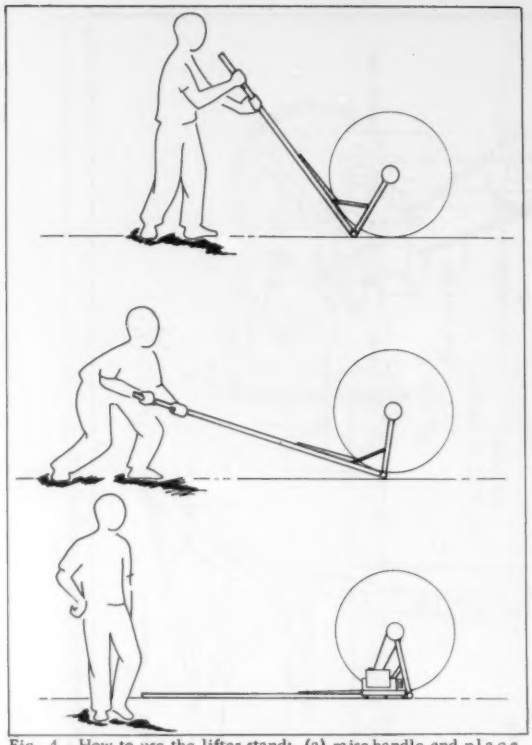


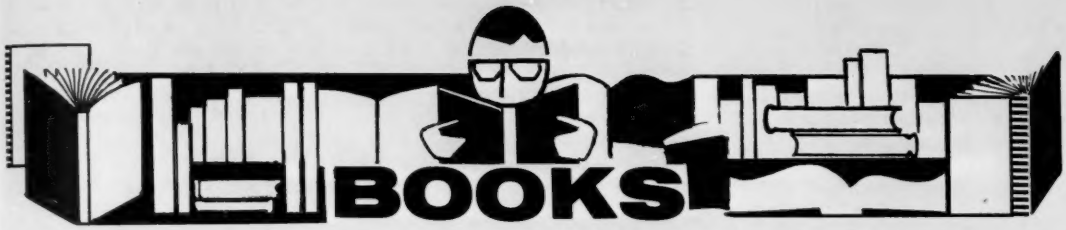
Fig. 4 - How to use the lifter stand: (a) raise handle and place the bearing against the axle; (b) push down on the handle to lift up the reel; (c) device ready to wind cable on to the reel.

wooden reel is turned by the drive arm pushing against a wooden block nailed to the reel flange. Cylindrical or conical adapters are slipped on the axle and case-hardened set screws are tightened in receiver holes in the axle to handle reels needing larger diameter axles.

The drive unit (Fig. 3) is held in place on the lifter-stand by mounting studs and wing nuts. The power source is a $3\frac{1}{4}$ hp., 4-cycle gasoline engine with a factory-installed 6 to 1 reduction gear. The shaft speed is from 300 to 400 r.p.m. The engine drives a 10 to 1 reduction gear through a clutch and V-belt with a 2 to 1 pulley ratio. The reduction gear drives the axle with a $\frac{5}{8}$-inch roller chain over 2 to 1 ratio sprockets. The axle speed is from 7 to 10 r.p.m.

The device can be set up and operated by one or two men. The cable reel is placed facing the block over which the cable will pass. The axle is passed through the reel and the adapter set screws are tightened. The handle of each lifter-stand is raised and the bearing is mated with the bearing surface of the axle (Fig. 4a). The handles are pulled down raising the reel (Fig. 4b, c). The drive unit is set on mounting studs on a lifter stand, the drive chain is put in place and the retaining nuts are tightened until the chain is taut.

This device has been used extensively since construction. The transfer of two 300-fathom sections of $\frac{5}{8}$-inch electrical towing cable from a vessel's winches to storage reels has been accomplished in less than 1 hour. The small size of components and their light weight make handling and storage easy. The machine is quite stable and may be used on rough and cluttered docks. The lifter-stand sometimes slides on a dock when a light reel is under tension, but it is easily realigned.



COMMERCIAL FISHING

"Fishing Boats and Equipment," by John Burgess, 216 pp., illus., 1966. Fishing News (Books) Ltd., London. Realizing the lack of literature on how to set about fishing for a living, Burgess has written a textbook based on information acquired as owner and operator of 6 boats in England and Australia during the last 30 years.

He provides some theoretical knowledge of fisheries, and describes the gear most important to the beginner. Designed to help both commercial fishermen and would-be fishermen, the book covers all important aspects of outfitting a boat for commercial fishing.

FISHING BOATS

"A Guide to Fishing Boats and Their Gear," by Carvel Hall Blair and Willits Dyer Ansel, 142 pp., illus., $5.00, 1968. Cornell Maritime Press, Cambridge, Md. The International Rules of the Road require that "All vessels not engaged in fishing . . . shall, when underway, keep out of the way of vessels engaged in fishing." To keep out of the way of a fishing craft, one must know what type of equipment it is using. Since nets, for instance, are invisible from an approaching ship, one must determine from the looks of a vessel what it is, what it is doing, and what it is likely to do next.

On a very modest scale, this book attempts to do for the world's fishing craft what Jane's or Talbot Booth's does for fighting and merchant ships. Chapter I describes the basic methods of the commercial fisherman and the equipment he uses. Succeeding chapters cover specific types: trawlers, hook and liners, gill netters, seiners, harpooners, support ships, research vessels, and small craft.

SPORTS FISHING

"Fishing From Boats," by Milt Rosko, 272 pp., illus., $6.95, 1968. MacMillan, New York. Rosko tells the fisherman everything he needs to know for successful fishing in coastal waters. He provides detailed information on fishing techniques, tackle, boats, and the species most likely to be found.

OCEANOGRAPHY

"The Ocean World," by Vladimir and Nada Kovalik, 191 pp., illus., 1966. Holiday House, New York. Oceanography is tomorrow's science. More than any other area, including the vast realms of space, it holds the promise of exciting development for the coming generation. This comprehensive, informative, well-written book is calculated to inspire potential oceanographers.

MAN IN THE SEA

"The Deepest Days," by Robert Stenuit, 222 pp., illus., 1966. Coward-McCann, New York. It has become a truism to state that our planet should be called Sea, not Earth, since salt water covers seven-tenths of its surface. Man has circled the moon, but the ocean in which we wade remains virtually unexplored and unexploited. The first major dive combining depth and time--432 feet and 49 hours--was made in June-July 1964, off Berry Island in the Bahamas. Two men made the dive, one the author.

Stenuit describes the preparations for the dive and the dive itself.

MARINE BIOLOGY

"Marine Biology IV: Proceedings of the Fourth International Interdisciplinary Conference," edited by Carl H. Oppenheimer, 485 pp., illus., 1968. Academy of Sciences

Interdisciplinary Communications Program, New York. Growing numbers of scientists are rapidly extending the frontiers of knowledge. From outposts of research, streams of new information pour into already-overloaded communication channels. New methods of investigation lead to increasing specialization. It takes a multidiscipline orientation and multiprofessional teamwork to solve many crucial problems in biology. In the effort to achieve a "breakthrough" in such basic fields as genetics, homeostasis, or growth and development, the researcher may find the needed clue unexpectedly in a new advance in other branches of biology.

This book is the record of an interdisciplinary conference on unresolved problems in marine microbiology.

MARINE MAMMALS

"A List of the Marine Mammals of the World," by Dale W. Rice and Victor B. Scheffer, 16 pp., 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209. This is a list of 117 marine mammals--now living, or which became extinct recently. Their geographic distribution and the systematic status of little-known species are included.

TUNA

"Some Operational Aspects of the Hawaiian Live-Bait Fishery for Skipjack Tunas (Katsuwonus pelamis)," by Vernon E. Brock and Richard N. Uchida, 9 pp., SSR-F No. 574, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

The skipjack tuna appears to be the major underutilized fishery resource of the central Pacific. It has been estimated to offer minimum potential yields of 140,000 to 225,000 metric tons a year. This study examines the presently modest Hawaiian skipjack fishery and some of the factors limiting it. Their removal, wholly or in part, could lead to the development of a major industry.

SQUID

"The Squid Fishery," by Charles H. Lyles, 19 pp., CFS No. 4833, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

The value of squid as food has never been fully realized in the U.S. It is high in protein and phosphorus, and delicious when fried and/or baked with stuffing.

Squid support a fishery that averages nearly 16 million pounds a year, worth about $500,000. Mr. Lyles provides historical statistics from 1879-1967, a history of the fishery, and several recipes.

ABALONE

"Feeding Habits of Paua," by B. R. Tunbridge, 18 pp., illus., Technical Report No. 20, 1967. New Zealand Marine Dept., Wellington, N. Z.

Describes the feeding habits of precommercial-size paua, Haliotis iris, in the intertidal zone, during their most rapid growth. Also records the varying quantities of different seaweeds found in their stomachs.

SHARKS

"Sharks, Skates, and Rays," edited by Perry W. Gilbert, Robert F. Mathewson, and David P. Rall, 624 pp., illus., 1967. Johns Hopkins Press, Baltimore, Md. Public interest in sharks has been centered around the shark-hazard problem. It is not the worldwide number of attacks but the publicity given to such incidents that results in economic losses in resort areas. It becomes a morale problem for whole units when some servicemen are attacked. A more effective shark deterrent is needed, but first we need to learn more about the shark's basic biology.

Investigators who work with sharks, skates, and rays are located in widely scattered laboratories, and their reports appear in many journals. An interdisciplinary symposium to review various contributions and techniques was held in Bimini in 1966. This book contains 39 of the papers presented there.

DOLPHINS

"The Dolphin Smile," edited by Eleanore Devine and Martha Clark, 370 pp., illus., $7.95, 1967. MacMillan, New York. Subtitled "29 Centuries of Dolphin Lore," this book is an anthology of the most informative and entertaining fact and fiction about dolphins from Homer to Flipper. Besides the wealth of

literature and lore, there are many articles based on the latest scientific research in dolphinology.

LARVICIDES

"Effects of Lamprey Larvicides on Invertebrates in Streams," by Richard Torblaa, 13 pp., illus., SSR-F No. 752, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

A program to control the sea lamprey in the Great Lakes with the larvicide TFM, sometimes used with Bayluscide as a synergent, began in 1958. Torblaa examines the effects of these chemicals on aquatic invertebrates in natural streams.

GULF OF MEXICO

"Fishermen's Atlas of Monthly Sea Surface Temperatures for the Gulf of Mexico," by Luis Rivas, 28 maps and 5 text pages, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

Increasing interest in the fisheries and marine biology of the Gulf of Mexico has created a strong demand for environmental data. Available bottom temperature data are inadequate to prepare a meaningful summary. But the surface temperatures shown in this atlas indicate the trends in the shallower coastal waters and should help fishermen interpret their own temperature observations.

PUERTO RICO

"Inland Game Fishes of Puerto Rico," by Donald S. Erdman, 88 pp., illus., 1967. Dept. of Agriculture, Puerto Rico. Writing primarily for the sports fishermen, Erdman describes the game fishes of the larger reservoirs, rivers, and lagoons. He examines the origins of the inland fishery, and identifies the native and introduced freshwater fishes.

MAPS

Antarctic Map Folio Series, American Geographical Society, Broadway at 156th St., New York, N. Y. 10032:

"Folio 10: Primary Productivity and Benthic Marine Algae of the Antarctic and Subantarctic," by E. Balech, A. Z. El-Sayed, G. Hasle, M. Neushel, and J. S. Zaneveld, 15 plates and 12 text pages, $6, 1968. The folio shows distribution and abundance of the phytoplankton standing crop, the primary organic productivity, and the nutrient chemicals in waters along the paths of research vessels in the Pacific sector of the Antarctic and Subantarctic, the southwest Atlantic, Drake Passage, Weddell Sea, and waters west of the Antarctic Peninsula. Four plates show the circumpolar distribution of selected species of diatoms and dinoflagellates.

"Folio 11: Distribution of Selected Groups of Marine Invertebrates in Waters South of 35° S. latitude," by A. W. H. Bé, et. al., 29 plates and 40 text pages, $10, 1968. The rich waters surrounding Antarctica contain a vast number of marine invertebrates. This folio contains distribution maps of those genera and species about which the most informative data have been collected. An introductory test by Dr. Joel Hedgpeth discusses the general oceanographic setting of the Antarctic, the distribution of bottom communities, and the present status of bipolarity.

--Barbara Lundy

U.S. AND USSR AGREE ANEW ON SOVIET FISHING OFF U.S. MIDATLANTIC COAST

Barbara Lundy

In early December 1968, the U.S. and the USSR signed a new agreement on fisheries off the midatlantic coast of the U.S. It extends and modifies the one originally concluded in November 1967. The U.S. delegation, led by Ambassador Donald L. McKernan, Special Assistant for Fisheries and Wildlife to the Secretary of State, included advisors from sports fishing interests and commercial fishing industries, and state fishery officials from New Jersey, New York, Rhode Island, Massachusetts, and Maine.

The new agreement provides greater protection for scup (porgy), fluke (summer flounder), red hake, and silver hake (whiting), species traditionally of prime interest to U.S. sports and commercial fishing.

Under the 1967 agreement, a rectangular area of several thousand square miles, extending south of Long Island and Rhode Island, was closed to fishing by large vessels during January through March 1968. During the same 3 months for the next 2 years, 1969-1970, the closed area will be an elongated belt, roughly along the 50-100 fathom line, from Rhode Island to Virginia. This area, outside U.S. jurisdiction, encompasses a substantial part of the wintering grounds of all 4 species.

THE AGREEMENT

Under the agreement, large Soviet vessels fishing in the area will continue to restrict their catches of the 4 species to the 1967 level, which was considerably below the 1966 catch. For example, the Soviet catch of red hake declined from 25,722 metric tons in 1966 to 14,884 tons in 1967. Overall Soviet catch in the area declined from 131,075 tons to 47,086. Preliminary Soviet data indicate that her 1968 red-hake catch in the midatlantic area will be about 2,000 tons, and overall catch less than 50,000 tons.

Noting the significant reduction in Soviet fishing effort in the area, the U.S. agreed to permit the Soviet fishing fleet to continue to use 2 small areas within the U.S. 9-mile contiguous fishing zone off New Jersey and Long Island for loading operation; also, the U.S. will permit the Soviets to fish in a small area off Long Island during specified periods during the winter. These areas are unchanged from the 1967 agreement.

U.S.-USSR Joint Research

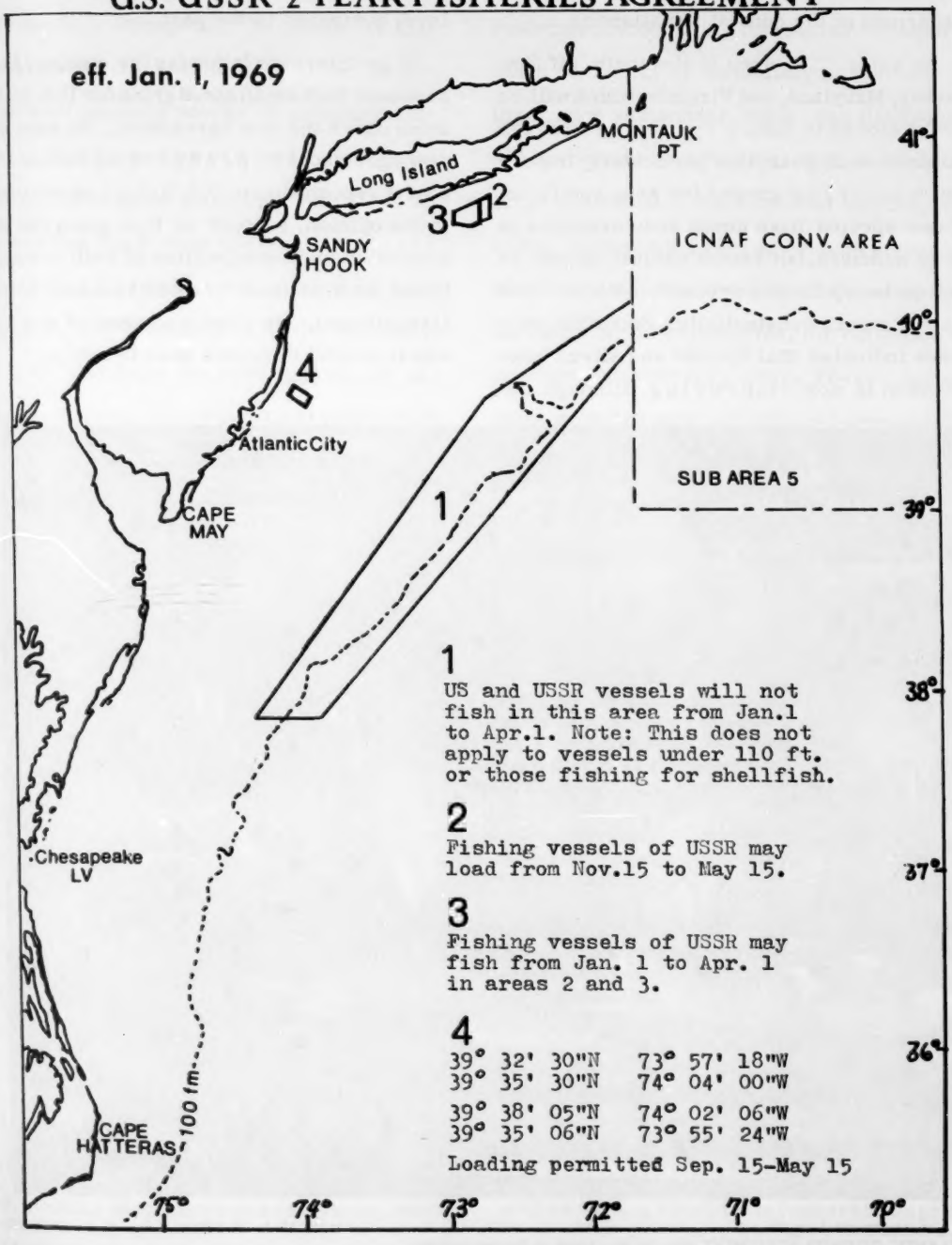
Scientists using research vessels from the U.S. and the USSR conducted joint surveys and research from the BCF Biological Laboratory at Woods Hole, Mass., in 1968. A number of factors affecting the midatlantic fisheries were evaluated during this cooperative scientific work, which contributed to the successful conclusion of the new agreement.

AMBASSADOR McKERNAN'S VIEW

Ambassador McKernan noted that the change in the area of the closed zone would

Mrs. Lundy is CFR Associate Editor.

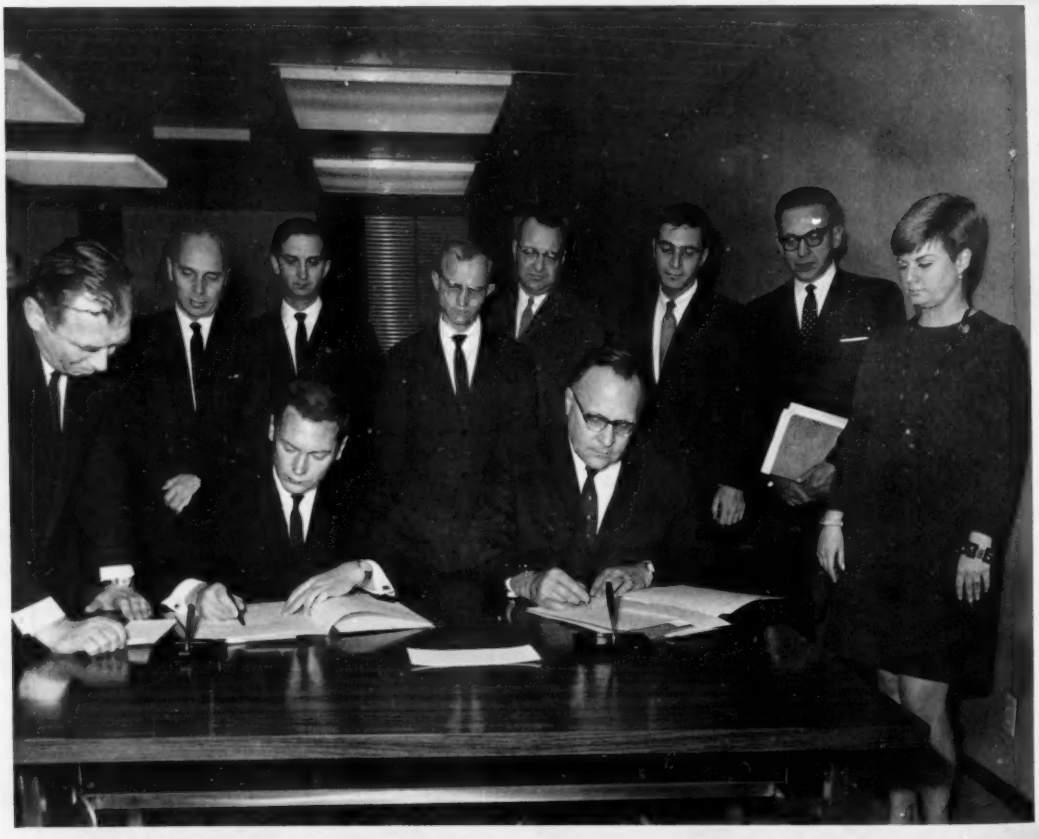
U.S.-USSR 2-YEAR FISHERIES AGREEMENT



especially benefit sports and commercial fishermen of the coastal midatlantic.

He said: "The area to the south, off New Jersey, Maryland, and Virginia, which will be newly closed to fishing by large vessels for 3 months each year, is a particularly important wintering ground for scup and fluke. These species have never been available in large numbers, but recent natural causes as well as heavy fishing pressure have reduced their numbers substantially. Scientific evidence indicates that the red and silver hake situation is now improving, although the abundance of these 2 species is still at a low level compared to the past."

In an interview following the signing, Ambassador McKernan noted gains for U.S. fisheries under the new agreement. He said the new agreement represents an advance in Soviet recognition of U.S. fishery objectives. In his opinion, support of U.S. goals for the protection and conservation of both international and national fisheries has been strengthened. He cited a number of ways in which coastal fisheries have benefited.



V. M. KAMENTSEV (left), First Deputy, Ministry of Fisheries, USSR, and Ambassador DONALD L. McKERNAN sign U.S.-USSR MID-ATLANTIC FISHERIES AGREEMENT attended by experts of the two nations.

• "The first, and most immediate benefit, from the U.S. standpoint," he noted, "is that limitation of fishing on the edge of the Continental Shelf protects stocks of primary concern to American sports and commercial fishermen more fully than before. It so happens that the Soviets are particularly interested in certain species, such as herring, that are presently of little concern to the U.S. Modifying the 1967 agreement allows the Soviets the opportunity of more herring fishing on the high seas. It allows our fishermen this opportunity as well.

• "The second important gain, from the U.S. point of view, is that a much clearer and more comprehensive program can be envisaged," Ambassador McKernan continued. "The Soviets have shown a willingness to cooperate, and to use their research ships to work with the U.S. in developing conservation programs. This cooperation will expand our research capacity without requiring more funds from the U.S. and will increase our knowledge of resources along our coasts. It also will enable us to formulate both national and international conservation programs for all our fishery resources, including those we are not using very much now, but probably will be using much more in a few years, such as herring.

• "Thirdly, the new agreement specifically restricts Soviet fishing on species of importance to us, but of absolutely no concern to them, such as flounder, soles, and flatfishes. We have feared the Soviets were harvesting large quantities of such species as scup and fluke. Although the 1967 agreement indicated they would not take these species, except as incidental to other fisheries, the definition of incidental was not very clear. The new agreement provides new language and new understanding about these fisheries. Incidental catch is explicitly defined; now their interpretation is the same as ours."

One U.S. long-range international fishery policy of particular concern is that some preference must be given to small coastal fishermen obliged to compete for the same stocks of fish with large distant-water fleets, the Ambassador noted. He added: "To a modest extent, and in a somewhat indirect way, the agreement does advance the U.S. policy towards getting recognition by an important fishing state of the concept that the coastal state, in some circumstances, must have preference in harvesting coastal stocks.

"The agreement, from the U.S. point of view, thus serves long-range interests, as well as solving short-term conservation problems of the fisheries of the midatlantic Bight."

U.S. & JAPAN SIGN 2 AGREEMENTS

Representatives of the U.S. and Japan met in Washington, D. C., beginning Nov. 13, 1968, to discuss the future of two agreements: the Eastern Bering Sea King Crab Agreement, signed in 1964 and extended in 1966; and the Agreement of May 9, 1967, concerning Japanese fishing within the U.S. contiguous fishing zone and in adjacent areas off the U.S. Agreements were initialled on December 3. On December 23, 1968, the new arrangements--which will remain in effect until Dec. 31, 1970--were signed by Secretary of State Rusk and Ambassador Shimoda.

King Crab

The new King Crab Agreement provides for a drastic 48-percent reduction in Japan's annual crab production, from 163,000 cases ($\frac{1}{2}$-lb. 48's) to 85,000 cases for 1969 and 1970. This measure is designed to arrest the serious decline in the king crab stocks and to assure that the resource will be available for harvest to U.S. fishermen. The agreement also provides for expansion of the existing pot fishing zone, and for Japan to conduct a prudent fishery for tanner crab.

Fishing Off U.S.

Several major changes were made in the agreement relating to Japanese fishing operations off the U.S. coast. Japan agreed to prohibit its vessels from trawling at night during the first 12 days of the halibut season in an extensive area in Areas 4A and 4B in the eastern Bering Sea. The purpose is to avoid damage to U.S. halibut fixed gear.

Japanese vessels will also refrain from operating in the area landward of the isobath of 110 meters between Grays Harbor and the mouth of the Columbia River (between 46°14' N. latitude and 46°56' N. latitude). This is a popular salmon sportfishing area.

Understanding was also reached on alleviating the fishing pressure on Pacific Ocean perch stocks off Washington and Oregon.

New Loading Zones

In exchange for the Japanese concessions, the U.S. agreed to permit Japanese vessels to conduct loading operations in 3 additional localities. The existing 2 are off Kayak Island and Sanak Island. The new zones are off Forrester Island and near Marmot Island off Afognak Island in the Gulf of Alaska, and off Destruction Island, Washington.

The U.S. delegation was led by Ambassador Donald L. McKernan, Special Assistant to the Secretary for Fish and Wildlife, Department of State. It included Clarence F. Pautzke, Assistant Secretary for Fish and Wildlife, Parks, and Marine Resources, Department of Interior; H. E. Crowther, Director, Wm. M. Terry of BCF; and industry and State officials.

--L. M. Nakatsu

UNDP/FAO Caribbean Project Explores for Snapper

The exploratory fishing vessel 'Calamar' conducted experimental trawl fishing between Trinidad and French Guiana from June 1967 to April 1968. Most of it was done in comparatively shallow waters, less than 20 fathoms, where the bottom was muddy or sandy or both.

Cruises in April-July 1968 extended trawl coverage to greater depths. Below 20 fathoms, the bottom is usually limestone or other calcareous material, so the trawl was fitted with rubber bobbins (rollers).

Gear

The trawls, braided nylon with 4-inch stretched mesh, measured 52 feet on a headline carrying 26 8-inch floats, and 72 feet on a footrope with up to 27 14-20 inch diameter rollers. The 2 x 1 meter (6.6 x 3.3 foot) doors were fished with bridles and ground cables.

Areas and Depths

The principal task was to find areas that might yield snapper. Coverage extended from French Guiana in the east to Tortuga Island, Venezuela, in the west. Over 90% of the 114 trawl drags were made between 20 and 70 fathoms.

Catches

Catches were uniformly low, varying from 41 pounds/hour off Venezuela to 186 off Trinidad. Total marketable catch ranged from 7.1 pounds/hour off Guyana to 67.3 off Trinidad and Tobago. French Guiana yielded the highest percentage of snappers taken--38% of total catch--mostly lane snapper, Lutjanus synagris. The lowest snapper catches (2.6%) were made off Trinidad.

One unexpected catch was a bushel of scallops caught off Margarita Island, Venezuela. Shell width was about 3 inches and meats averaged 65/pint measure. Ordinarily the roller-rigged trawls used at the time would not be expected to take any quantity of scallops.

Other marketable fish caught were jacks (Carangidae), croakers (Sciaenidae), grunts (Pomadasyidae), goatfish (Mullidae), porgys (Sparidae) and, off Trinidad, moonshine (Selene vomer).

Invertebrates found in the catches were sponges, crabs and lobsters, jellyfish, corals, and various molluscs. Industrial species were various small sharks and rays (over 50%), cutlassfish, catfish, lizardfish, batfish, and others.

UN's Caribbean Fishery Development Project

The United Nations has provided the sum of $2,548,000, and 16 participating nations $773,000, to help develop the fisheries of the Caribbean region. FAO is responsible for carrying it out.

The project has 3 objectives: 1) to find pelagic (open-sea) fish and to determine the best methods of catching them; 2) to train fishery officers and fishermen; and 3) to develop fish facilities and marketing techniques.

The first 2 goals may be achieved by the UN vessels 'Calamar,' 'Alcyon,' and 'Fregata.'

The marketing part of the project is being studied by the Economics Section headquartered at Bridgetown, Barbados. UN observers report: "Retail selling in the markets is primitive, packaging generally nil; ice-producing plants are insufficient, and cold chambers generally non-existent." The staff of the Economics Section often tries to persuade governments to invest in fish processing and conservation facilities.

UN specialists believe that government support is vital to balanced development of wholesale and retail marketing. They maintain that facilities to preserve and process fish must be established to even out the temporary gaps between demand and supply.

May Encourage Private Investment

Like other projects of a "pre-investment" character, this UN project aims in the long run to attract private investment capital.

However, to date, only the jumbo-prawn industry has attracted large-scale investment. It came from the U.S. In Guyana, for example, 75 prawning boats provide prawns to a well-equipped processing and freezing plant.

Fig. 1 - The processing plant of the American "Seafoods Guyana Company." Here, jumbo prawns are washed in chilled water. Then they are put in cardboard boxes and stored in cold chambers. Some lots are shelled to meet customers' requirements. Prawns are shipped to U.S. in a refrigerated ship.

Fig. 2 - Fish market at New Amsterdam, Guyana. The fish are snappers and snooks. This market is scheduled to be replaced in a couple of years by a modern center. It will be built with Canadian aid of $185,000.

Fig. 3 - M. Lionarons, head of Surinam's Fisheries Department, examines small fish and shrimps drying in a village on Surinam River.

Fig. 4 - The UN vessels have tried live-bait fishing for tunny. To do this, the bait must be caught first. The vessels come into a different anchorage each evening and fish with a blanket net slung from outriggers.

The fish are attracted by a powerful electric light in the traditional technique of Mediterranean lampara fishing. The stick-held blanket net used for fishing for live bait is retrieved by using a small dinghy. The light attracts the fish over the net.

(FAO/H. Menjaud)

Greenland-Faroese Agreement on Fishing Rights

In early October 1968, Faroese fishermen were granted the right to fish in certain areas of Greenland's 3-mile zone and to continue operating their own shore stations to process catches. Such an agreement probably will not be necessary again because June 1967 legislation opened Greenland fisheries to equal entry by all Danish citizens regardless of residence. (U.S. Embassy, Copenhagen, Oct. 1968.)

France Building Shrimp Trawlers for Greece

Evangelistria Fishing Co. of Greece has ordered 2 shrimp trawlers from a French shipyard. They will be about 82 feet long overall, 22 ft. broad, draw slightly over 8 ft., be fitted with 390-hp. main engines and 85-hp. auxiliaries, and have 3,900 cu. ft. freezing holds.

The fully equipped steel trawlers are to be delivered in April 1969. ("Alieia," Sept. 1968.)

Yugoslav Experts Visit Soviet Union

In early 1968, a group of Yugoslav freshwater fishery experts toured Soviet scientific institutes from Leningrad to the Crimea.

They called at the Ukrainian Fisheries Institute at Kiev, which employs about 100 professionals who are studying hybridization, poly-culture, feeding, thermal water culture, etc., and demonstrate the application of new methods.

Extensive Tour

The group also visited the Soviet's largest hatchery at Gorjackii Kliuch, which produces up to 250 million fingerlings a year. At VNIRO, in Moscow, they discussed acclimatization and hybridization studies.

The Belorussian Fisheries Institute at Minsk was included in the tour. Belorussia has the lowest fish prices in the USSR, and earns a 5% return on capital invested in fishery enterprises.

Salmon Tag Returned by Soviet Scientists

A salmon tagged by Oregon Fish Commission biologists off Port Orford in September 1967 was captured on the high seas north of Heceta Bank, about 33 miles off the Alsea River mouth, by the Soviet research vessel 'Oghon' on August 8, 1968. The tag and pertinent biological information were forwarded to the Commission's Astoria research headquarters by the Pacific Research Institute of Fisheries and Oceanography in Vladivostock.

The Oghon has conducted extensive fishery research off the U.S. Pacific coast and has been a regular visitor off Oregon in recent years.

The Oregon State Fisheries director said the Soviet report of the tag recovery is in keeping with current exchanges of scientific information between U.S. and Soviet fisheries biologists.

EEC Fisheries Policy Still in 'Proposed' Stage

The European Parliament generally endorsed the European Economic Community (EEC) Common Fisheries Policy on Oct. 24-25, 1968. The Parliament, an advisory body within EEC, must be consulted on all EEC actions. Power of approval, however, lies with the Council of Ministers, and they have not taken final action. Therefore, the EEC Common Fisheries Policy is still only "proposed." Endorsement by the European Parliament is important in that it reflects the general feeling of countries concerned.

EUROPE

West Germany

GOVERNMENT SUPPORT FOR FISHING INDUSTRY CHANGED IN 1968

Government support for the fishing industry changed significantly in 1968. Total outright aid increased 1.7% to about DM 30.2 million (DM 4.004 = US$1). Because unspent funds from previous appropriations were available, aid granted on a loan basis was reduced from DM 12.2 million in 1967 to DM 1.7 million in 1968. However, the government was permitted to make advance commitments of up to DM 4.5 million.

Subsidies on diesel fuel used by luggers and cutters, granted since 1951 and totaling DM 2.7 million in 1967, were discontinued in 1968.

Exvessel Subsidies Replaced

Structural and consolidation aid increased from DM 7 million to DM 9 million; it was granted under a new policy in 1968. Previous support had been given through exvessel subsidies based on quantity, type, and grade of fish landed. This was discontinued, although money was provided to cover commitments made under the old system.

The 1968 appropriation was simply the first part of a 3-year DM 27 million program. Approximately DM 16.6 million will be used to help scrap 30 trawlers, 26 luggers, and about 200 cutters. Scrapping premiums will be allowed at the rate of DM 400 per gross ton for trawlers, and DM 600 per gross ton for luggers and cutters.

The remaining amount, slightly over DM 10 million, was slated to be used to: (1) convert "fresh fish" trawlers to partial or full freezer trawlers; (2) instal fish-meal plants on stern trawlers; (3) instal mechanical fish discharging devices on fishing vessels; (4) construct cutters with a minimum overall length of 36 feet, and (5) establish producer organizations.

Research and Service Vessels

Nearly 4.6 million marks were provided to complete a vessel for policing and protecting fisheries. A small sum was appropriated to begin planning a new research vessel.

Loan Aid

No provision was made in 1968 for new construction loans for trawlers and luggers because previous appropriations had not been fully used. The DM 4.5 million authorized for this will not be disbursed until 1969. Loans, not to exceed 25% of the total cost of a vessel, will be a maximum DM 1.5 million per vessel. Minimum interest on the 14-year loans will be 4%.

Government-Controlled Sales Promotion

After August 1, 1968, the legally required contributions from the fishing industry, dealers, and importers for fish sales promotion were increased to DM 0.20 per 100 kilograms. The fishing industry has promised to contribute additional funds to the joint advertising fund now that dealers and importers must contribute more.

Denmark

RED TIDE KILLS MARINE LIFE ON WEST COAST

In early October 1968, dead and dying fish, birds, and marine invertebrates were found along Denmark's west coast from Hirtshals to Esbjerg. Fishermen were especially concerned because of the large number of dead cod. Danish Fisheries and Marine Research Division biologists found a bloom of 'Gymnodinium,' the minute toxin-producing alga that caused the red tide off Florida several years ago. This was the first time this type of alga had been found in North Sea plankton samples. By mid-October, die-off reports had stopped. The algal bloom had developed under abnormally warm and calm conditions. With the arrival of cooler weather and some wind, it appeared to peak and then decline. Although many fish died, biologists believe no great catastrophe occurred.

Mussels Unaffected

During October, a large blue mussel (Mytilus edilus) fishery normally begins in the

Denmark (Contd.):

southern part of the affected area. Countless tests of mussels from the area showed no indication of toxicity, allaying doubts that they were unsafe to eat.

Eel Mortality Caused by 'Red Sickness'

Eel mortality was high in 1968. Heaviest loss was in the western part of the Limfjord, very close to the North Sea coast where dead fish had been observed. This raised speculation that the same causative agent was involved. The biologists said, however, that the eel loss resulted from an especially virulent attack of 'red sickness,' a common eel disease caused by a well-known bacterium, and that eel mortality was unrelated to the red tide. (U.S. Embassy, Copenhagen, Oct. 16, 1968.)

Netherlands

FIRM MARKETS
NEW SHRIMP PEELER

A new shrimp-peeling machine that handdles about one a second is being marketed by N. V. Maschinenfabriek, B & S Bedrievjen, v.d. Woerdt, Hengolo. It separates the shrimp and turns them in the right direction for peeling. Spoiled shrimp, or those not turning in the proper direction, are rejected and returned to the supply hcpper, or carried out on a separate conveyor belt. This leaves only the best shrimp to be processed under the most hygienic conditions.

Designed for 'Crangon'

The machine was designed specifically for 'Crangon,' small brown shrimp processed in large quantities in the Netherlands. It also may be used for the small northern shrimp, Pandalus borealis. (U. S. Embassy, Copenhagen, Nov. 1968.)

Norway

CANNED FISH PRODUCTION
AND STOCKS

The brisling season normally ends about mid-October. In fall 1968, fishing was not good, and the final 1968 pack was expected to be below average. Because of a fairly good carryover from the previous season, stocks may last until the 1969 pack is available, but this can vary from firm to firm. Exports were at about the 1967 level.

Sild Sardine Supply Unsatisfactory

Sild sardine supplies were not satisfactory, either in quantity or size. Exports exceeded production, depleting stocks about 3%. September 1968 stocks were expected to last about 3 to 4 months, but some items were in short supply. The main packing season should have built stocks gradually over the next months, maintaining supplies through the closed season beginning Feb. 1, 1969.

Kipper Situation Desperate

The kipper situation was desperate; stocks were nearly exhausted. Normal packing was still about 5 months away; shelf space and distribution would be lost in practically all markets, unless stocks could be replenished from North Sea herring in the meantime.

Anchovy Production Delayed

Anchovy production should have started by September, the normal period, but manufacturers deliberately delayed because the unusually mild weather would have caused premature ripening.

Crab Production Low

Crab production was still below 1967's pack at the same time. High temperatures and smooth seas were partly responsible for poor catches.

Insufficient Herring

Unfavorable weather hampered Iceland herring fishing, and landings were insufficient to cover requirements.

Mackerel Catches Good

Mackerel catch was very good. Mackerel production during first-half 1968 amounted to about 50,000 cases, slightly below 1967. The main packing season is in autumn. An estimate of 1968 production will be available at year's end. ("Norwegian Canners Export Journal," Oct. 1968.)

USSR

SCHEDULES FISHERY RESEARCH THROUGH 1975

The Soviet Academy of Sciences' Scientific Council on Hydrobiology, Ichthyology, and Exploitation of Biological Resources of Water Bodies met in Moscow in early 1968. The Ichthyology Commission of the Fisheries Ministry and the Hydrobiological Society held sessions at the same time. This large gathering of fishery scientists planned industrial and scientific research projects as far ahead as 1975.

Research Planned

The Council planned coordinated research for the biological use of natural and technological warm waters. The scientists discussed the future of biological exploration in the Black Sea; underwater hydrobiological exploration in the Barents Sea and Antarctica; artificial breeding of marine organisms; research on technical hydrobiology (protection against encrusting organisms, woodborers, and other harmful organisms); water pollution in Lake Baikal; and fresh water in Siberia.

Research Projects

The Ichthyology Commission submitted these research projects: (1) coordination of scientific fisheries research for 1966-1970; (2) biological research on inland fisheries for 1968-1970; (3) research on the development and exploitation of warm water fisheries for 1968-1970; (4) research plan for increasing the productivity of inland water bodies for 1970-1975. The Central Administration for Inland Fishing and Fish Culture and the Ichthyology Commission have developed a research project on the acclimatization of fish and invertebrates in inland waters.

P. A. Moiseev, of the Research Institute of Fisheries and Oceanology (VNIRO), reported on ocean fishery resources. He estimated the present annual yield at about 60 million tons. He feels that it could be 90 million, if pelagic fisheries are expanded, and insists that any further expansion of Soviet high-seas fisheries must be based on this. ("Voprosy Ikhtiologii," 1968.)

Iceland

CURRENCY DEVALUED AGAIN IN 1968

On Nov. 11, 1968, Iceland devalued the kronur by 35.2%. The U.S. dollar is now worth 88 kronur. The reason given for devaluation was that exports had decreased 45% since 1966 because of falling world prices for fish products--mainly herring oil and meal.

United Kingdom

U.K. PUTS 10% TARIFF ON FROZEN-FISH FILLETS

On Nov. 6, 1968, Britain announced a 10% tariff on frozen-fish fillet imports from European Free Trade Association (EFTA) countries. The government was concerned about pressure on the domestic market caused by the growth of these imports. Austria, Denmark, Portugal, Norway, Sweden, Switzerland, and the U. K. are EFTA members. (Reuters, Nov. 6, 1968.)

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St. Pierre-et-Miquelon

Fish Market Deteriorates

A general deterioration of the fish market has seriously affected the economy of St. Pierre-et-Miquelon. Fishermen's subsidies will have to be increased, though the entire industry already is subsidized.

The US$20 million transshipment port construction, including dredging the harbor bottom to 20 feet below its present level, is expected to take 2 or 3 years. Because all heavy building equipment must be shipped in from Canada, and rented for dollar currencies, construction has been very slow.

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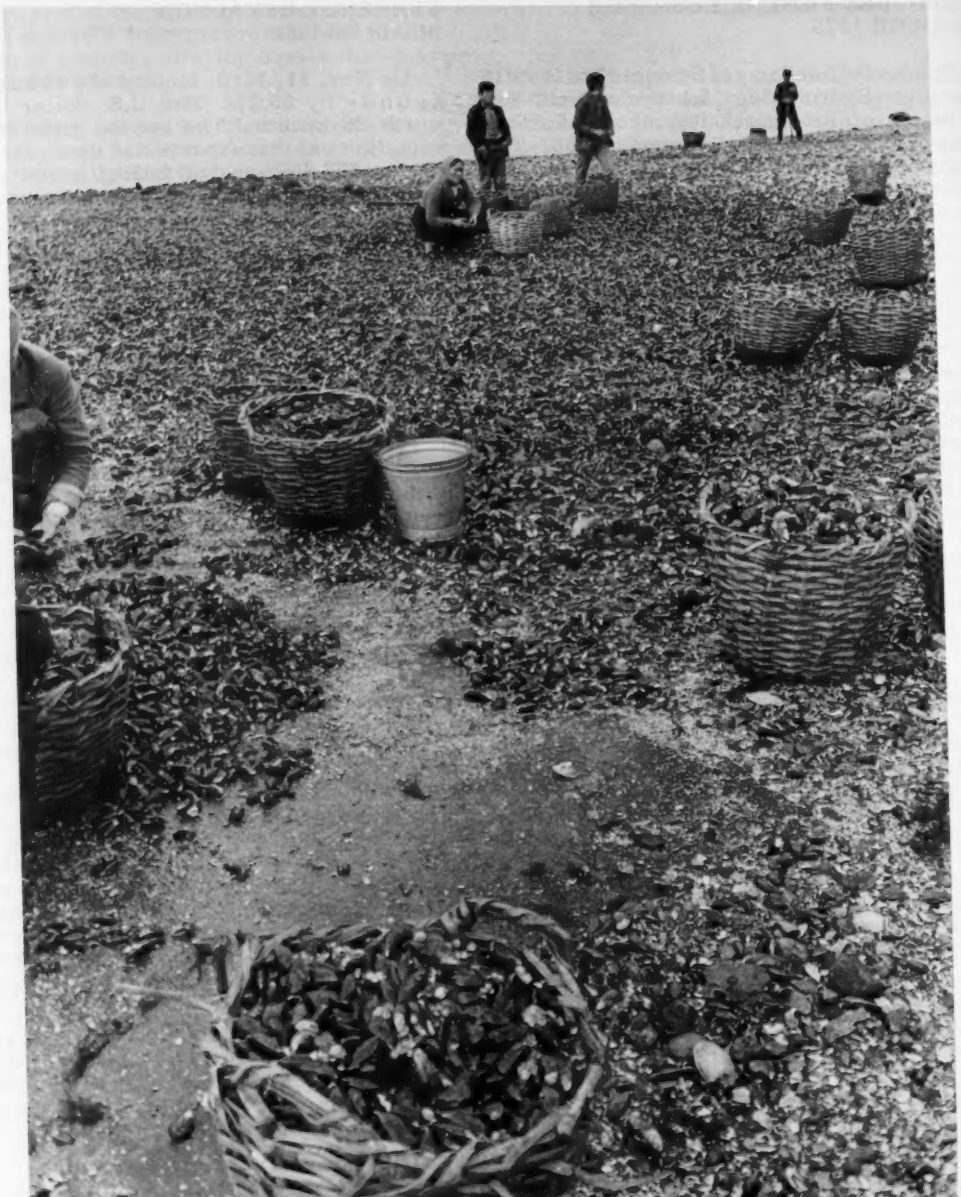

Shellfish left on a beach in Southern Chile. They must be well closed and alive when harvested. They are raked often to prevent them from burrowing down and escaping. (FAO/S. Larrain)

LATIN AMERICA

Mexico

MEXICAN-SPANISH COD-FISHING VENTURE IN NORTHWEST ATLANTIC

Two Spanish vessels have landed the first 'bacalao,' or salt cod, caught in the Northwest Atlantic under a Spanish-Mexican agreement. Five hundred tons arrived at the Gulf port of Coatzacoalcos in late October 1968. Mexico hopes her own vessels eventually will produce enough salt cod to replace traditional imports from Norway and other countries.

Local & Foreign Markets

Several months ago, 'Empresa Bacaladera Mexicana, S.A.,' a Mexican company financed largely by Spanish capital, built a 4-million-peso (US$320,000) processing plant at San Bartolo, Naucalpan, near Mexico City. The plant will clean, cut, and finish drying the salt cod landed. At first, the bacalao would be distributed only in Mexico. After Christmas, when it is in great demand, it was to be exported to other Latin American countries. Direct production of salt cod by Mexican-based vessels should cut about 25% from the traditional price of 35 pesos per kilo (US$1.27 a lb.).

The two vessels, manned by Spanish crews on the first trip, took 5 Mexican fishermen each on a second. If Empresa Bacaladera exercises its 1-year option to buy the vessels, they probably will have all-Mexican crews within two years. (U.S. Embassy, Mexico, Nov. 6, 1968.)

Peru

BUILDS FIBERGLASS PURSE SEINERS

Five 93-foot, 440-ton-capacity, fiberglass purse seiners are being built by Maestranza y Astillero Delta, S.A., Callao, and Dynamarc Corp., Costa Mesa, Calif. They will catch anchovy for the fish-meal industry. More may be built, depending on the success of the first 5. Dynamarc personnel are in Peru supervising construction. (U.S. Embassy, Lima, Nov. 1968.)

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Cuba

INCREASES FISHING FLEET

East Germany is building 5 Atlantik-class stern trawlers for Cuba; the first was scheduled to be delivered by the end of 1968. East Germany is building 15 other stern trawlers, 45 meters (147.6 ft.) with 7-metric-tons-a-day fish-meal production capacity; 5 will be delivered in 1969, 10 in 1970. Two 550-ton hold capacity freezer barges will be delivered by 1970.

Most of the 90 fishing vessels Cuba has ordered from Spain should be operating in 1970. Three freezer trawlers were delivered in 1968.

Fleet Landings

All the vessels will join 'Flota Cubana,' Cuba's high-seas fishing fleet. Fleet landings increased from 5,200 tons in 1966 to 20,100 tons in 1967. Catch was expected to reach 26,000 tons in 1968, and it is expected to rise to 40,000 in 1970.

New Fishing Methods

Cuba has been testing new fishing methods in the Gulf of Mexico. Daily catches up to 10 tons have been made fishing sardines with electric lights and dragnets. Commercial-scale purse seining is planned for 1969. Catches will be transferred to special vessels at sea, so factory ships will not have to return to port every 12 to 15 days when holds are full.

Fish-Meal Production

Cuba plans to expand fish-meal production in 1969. Two plants will be built, one of these in Cienfuegos.

Chile

FISHERIES SCHOOL SPURS DEVELOPMENT

Chile's Fisheries Development Institute is playing an important role in providing the technical background necessary to develop the nation's fisheries. The work of the

Chile (Contd.):

UN-supported institute covers all aspects of the fishing industry: Northern Chile--anchoveta; Central--demersal fish; and Southern--shellfish.

Figs. 1 & 2 - At Puerto Montt, Southern Chile, fishermen pull their boats up on the beach so villagers can buy the fresh fish over the side.

Fig. 3 - Fisherman brings tuna catch ashore from small boat. (FAO/S. Larrain)

In Southern Chile, the institute concentrates on the problems of catching, storage, and shipment to markets.

* * *

COST OF SHIPPING FISH MEAL TO U.S. RISES

On Jan. 1, 1969, the cost of shipping fish meal from northern Chile to U.S. and Canadian west coast ports went up $4 a metric ton, unless exporters were able to find cheaper means of loading. Shippers may pay $36 a ton, or load the meal themselves and pay $29 a ton. Rates for Peruvian shipments to west coast ports are unchanged, and rates to U.S. Atlantic and Gulf ports are not affected. A U.S. handling charge of $3.60 a ton applies to all meal shipped to west coast ports; handling costs are absorbed in shipments to Gulf and Atlantic ports.

High Loading Costs Responsible

The new rate replaces a hotly contested one. The latter was set by the Latin American Pacific Coast Steamship Conference on Sept. 7, 1968. The Conference raised the rate to $36 a ton, without giving exporters the chance to arrange their own loading. Chilean fishmeal exporters claimed discrimination because Peruvian rates were not increased.

Chile (Contd.):

Carriers claimed higher loading costs in Chile--about $7 a ton, compared to $2.60 in Peru--necessitated the increase. The U.S. Federal Maritime Commission has approved the new rate.

British Honduras

THE FISHING INDUSTRY

The entire coast of British Honduras is sheltered by a series of reefs, keys, and islands that form a barrier reef second in size only to the Great Barrier Reef of Australia. Surrounded by waters rich in marine life, the people of British Honduras have a long and renowned tradition of seamanship, fishing, and boat building.

There are 2 fisheries: the traditional one supplying the domestic market, and the export fishery less than 10 years old. For the most part, they depend on the same fishermen and boats.

The domestic market is supplied by a fleet of small sailing boats fishing principally with hook and line. Many have outboard motors, a few are inboard powered. Catches are landed at the public markets in Belize City, and other coastal and island towns, or sold directly to the consumer on the beach or at wharves. The most popular species are snappers and groupers. Fish is much more important in the local diet than it is in neighboring countries.

Spiny Lobster Fishery

Spiny lobster, the first export fishery developed, is still the most important. The fishery is regulated strictly with seasonal catch limits, closed seasons, and gear restrictions. A tagging program has been instituted, and tag returns have begun to show a migration pattern. Fishermen keep detailed log books showing their daily catches.

Lobsters are taken by 3 methods: The most important is the lobster trap. An unusual derivative of the trap--an old oil drum modified by a sort of fyke entrance built in one end--is fairly common. A fyke is a long bag fish net. No bait is used. The lobsters apparently enter in search of a dark hiding place. The third method is skin diving with spears or gaffs. A few lobsters are taken with dip nets and night lights.

Shrimp Fishery

A shrimp export fishery began in 1966, when good resources, principally pink shrimp, were discovered by a Republic of Honduras-based company doing exploratory fishing. Granted a permit to operate in British Honduras, the company is building a packing plant in Big Creek. The company is served by 6 privately owned trawlers. All are U.S. flag vessels licensed to fish in the Republic of Honduras. During 1966 and 1967, the trawlers operated from Guanaja, Honduras, and transported their catches to a temporary plant in Belize City. The shrimp, packed in the usual 5-pound cartons, are not sorted for size until they arrive in the U.S. Fin fish also are packed and frozen, either whole or as fillets. When the Big Creek plant is completed, the Belize City plant will continue to pack fin fish.

The best season for shrimp is during the first few months of the year; it declines after May.

Exports of Fishery Products From British Honduras

	Pounds Exported				
	1963	1964	1965	1966	1967 (Prelim.)
Lobster Tails, Frozen	345,361	403,000	431,500	387,900	316,610
Conch Meat, Frozen	86,310	120,900	78,900	135,900	376,350
Fish, Frozen	167,892	64,600	111,000	162,900	258,397
Fish, Dry salted, Smoked	71,123	31,900	49,300	46,000	46,606
Shrimp, Frozen	-	-	-	23,100	225,301

Most of the dry, salted, and smoked fish is exported to Guatemala and Honduras; practically everything else goes to the U.S. Lobster exports have leveled off, even declined, but recently opened operations on the southern coast should increase shipments. The rapid increases in frozen fish and conch exports are expected to continue to the point where they will exceed lobster on a volume basis. However, the extremely high prices commanded by lobster tails will keep them in first place in value for a long time to come, unless the rapidly developing shrimp fishery, also based on a high-priced product, continues to grow.

British Honduras (Contd.):

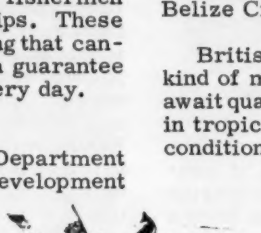
Sport Fishing

Tourism is expanding in British Honduras. Much of the attraction lies in calm, protected waters that teem with game fish and are among the clearest diving waters in the world. Several small hotels on the keys cater to fishermen and skin divers and operate boats for their use. In Belize City, several boats operated by former commercial fishermen make regular sport-fishing trips. These well-outfitted boats offer something that cannot be matched in most places--a guarantee that customers will catch fish every day.

Scientific Research

The Fisheries Section of the Department of Agriculture is responsible for development and conservation of the fisheries. Like its counterparts in other Caribbean countries, it is undermanned. However, FAO has supplied a biologist and a technologist in recent years. A fishery research vessel is being built in a local boatyard with a grant from the British government. The 36-foot 'Panilurus Argus,' named for the most common species of spiny lobster, was scheduled to be completed in 1968. The Bliss Foundation has provided a Marine Biological Station on the sea front in Belize City.

British Honduras is a fertile field for every kind of marine research. Real opportunities await qualified scientists who wish to pioneer in tropical research under excellent working conditions.



WHAT IS THE CONTINENTAL SHELF?

Officially, United States laws define the continental shelves as the seaward extension of the coast to a depth of 600 feet; this limit is set for the purpose of granting mineral rights, including oil drilling. The edge of the continental shelf, where the bottom begins to slope steeply, most commonly is found at depths between 360 and 480 feet.

At the time the shelf received its name, it was thought to be essentially flat; now geologists know that the continental shelf has basins, ridges, and deep canyons. Compared to the deeper ocean floor, however, the relief is gentle; hills and basins on the shelf usually do not exceed 60 feet.

The continental shelf width varies from practically nothing to several hundred miles. The shelf along the east coast of the United States is many times wider than that along the west coast. If all the continental shelves of the world are included, the average width is approximately 40 miles.

The shelf slopes gently, at an average drop of 12 feet per mile, from the shore to the continental slope. In contrast, the grade of continental slopes is 100 to 500 feet per mile.

About 7 percent of the ocean is underlain by continental shelves. These are the areas where intensive mineral exploration is now being conducted. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ASIA

Japan

COLD STORAGES ARE PLANNED TO STEADY TUNA PRICES

The Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN) has agreed to build and operate cold storages at the tuna ports of Yaizu, Chimizu, and Misaki to support tuna price stabilization. Tuna, primarily yellowfin, will be stored when the domestic market is oversupplied and be released when the market improves.

Two methods have been proposed: one is to store catches on a consignment basis, the other to purchase them. In the case of consignment, NIKKATSUREN would obtain government loans for vessel owners to defray operating expenses until the catches were sold. At Yaizu, small cold storages will be built at first and operated experimentally for one or two years. ("Suisancho Nippo," Nov. 16, 1968.)

* * *

FACES COMPETITION FROM NEW U.S. TUNA PRODUCT

The tuna industry is concerned with the growing penetration of its U.S. canned-tuna-in-brine market by a new U.S. product--canned tuna in vegetable broth. The U.S. packer, who began marketing it in summer 1968, has conducted extensive promotional sales in Chicago and Philadelphia, two major consumer centers for the Japanese product. The packer is planning to expand sales in New England, another major Japanese market.

Threat to Market

The Japanese interpret this as an attempt to win over their canned-tuna-in-brine consumers. Japanese packers would not be able to compete with large U.S. promotional sales, and trading firms could not keep selling at loss just to retain their U.S. market. ("Suisan Tsushin," Nov. 7, 1968.)

* * *

U.S. REJECTS MORE YELLOWFIN TUNA

The Japan Frozen Foods Exporters Assoc. is trying to cope with increasing U.S. rejections of frozen yellowfin tuna. During October 1968, U.S. packers rejected over 600 tons because of greenness or darkness in the meat after cooking. Japanese shippers had already lost more than US$278,000. The claims, running as high as 45% of shipments and averaging 13%, were the second highest since 1959. Then, U.S. packers rejected 40% of Japanese shipments from west Africa. Claims of 3-5% are usually settled between shipper and packer. Because of the enormous quantities rejected recently, and heavy losses suffered by Japanese suppliers, the Association planned to contact California canners to discuss use of green meat and settlements of claims.

Green Meat

In recent shipments, green meat was found primarily in large yellowfin tuna (over 100 lbs.) from the western Indian Ocean. While export tuna are inspected in Japan, fish taken in different areas become mixed in the shipments, making sampling very difficult. The Japan Frozen Food Inspection Corp. has developed a method of predetermining which tuna are likely to develop green or dark meat. It is reported to be 100% accurate, but problems still exist because 4-5 workers need an entire day to test 100 fish. ("Suisan Keizai Shimbun," Nov. 13, 1968.)

* * *

ADVISES FIRM NOT TO FISH E. PACIFIC YELLOWFIN TUNA

The Fisheries Agency has decided not to license Taiyo Fishing Co.'s purse seiner 'Hayabusa Maru No. 3' (275 gross tons) to fish in the eastern Pacific yellowfin tuna regulatory area. Taiyo had planned to send the vessel before the end of 1968. The Agency refused because purse seining there would have created excessive competition with longliners already fishing there. Introducing purse seiners into the regulatory area would have required Japanese participation in the Inter-American Tropical Tuna Commission as a member rather than observer. And, purse seining would have increased Japanese

Japan (Contd.):

tuna catch in the eastern Pacific, substantially affecting export prices--and perhaps led to U.S. imposition of quantitative restrictions on Japanese tuna imports.

Taiyo Will Appeal

The ban was not issued as a mandatory measure. It advised Taiyo not to send Hayabusa Maru while the Agency was studying Japan's distant-water purse-seine fishery. Some industry observers claimed that the Foreign Ministry, sensing considerable U.S. uneasiness over the planned entry, recommended the Agency's action. Despite the advice, Taiyo and several other firms plan to appeal for early authorization to purse seine in the area. ("Katsuo-maguro Tsushin," Nov. 21, 1968.)

* * *

YAIZU FISH LANDINGS DECLINE

In October 1968, landings at the major tuna port of Yaizu totaled 9,528 metric tons worth US$5.11 million. This was a drop from Oct. 1967 of 1,048 tons, or 10% in quantity, and $377,000 in value. Landings of all tuna species fell. Jan.-Oct. 1968 landings were 12,855 tons worth $54.6 million. ("Kanzume Nippo," Nov. 11, 1968.)

* * *

PRICE OF SAURY FOR BAIT SOARS

A steadily shrinking saury catch pushed bait saury prices up to US$554-580 a short ton at Misaki in early October 1968. Bait saury prices averaged around $328 a ton for 12 count per kilo (2.2 lbs.). Outside of crew expenses, the cost of bait was the largest operating expense for Misaki-based tuna vessels.

Good Bait

Saury is good tuna bait because of its odor and blue glow. But the high cost and small size--around 15 count--available for bait may force longline operators to substitute less expensive squid and mackerel. Tuna fishermen are very particular about bait quality. Some will leave a boat if the owner has not bought enough good saury for a trip. The use of less desirable bait could cause disputes between vessel owners and crews. ("Suisan Keizai Shimbun," Nov. 20, 1968.)

* * *

SAURY CATCH DROPS TO RECORD LOW

The saury fishery started well in early August 1968 but began to slow after September. It was feared that the 1968 catch might drop to an unprecedented low. By the end of October, catch was 113,379 metric tons, down about 59,000 tons from the 1967 period. This was about one month's catch in 1962, when landings peaked at 483,000 tons.

150,000 Tons in 1968

The 1968 season's total catch should be around 150,000 tons, compared with 210,000 in 1967. This sharp decline created a severe bait saury shortage for tuna fishermen and pushed prices up around US$128 a short ton in one month. Canned saury production also was expected to sink to a record low in 1968. ("Kanzume Nippo," Nov. 11, 1968.)

* * *

RESEARCH VESSEL TRAWLS OFF PERU AND CHILE

The 2,539-gross-ton research vessel 'Kaiyo Maru' departed Japan Nov. 5, 1968, on an exploratory cruise to the waters off Peru and Chile. Her purpose is to investigate the region's potential for trawling. Fourteen scientists, headed by Dr. Doi, Tokai Regional Fisheries Research Laboratory, were aboard.

The vessel was scheduled to call at Honolulu, depart there Nov. 20, and trawl off Callao, Peru. A call at Valparaiso, Chile, around mid-January 1969 was scheduled before trawling off Chile. Then the vessel will proceed to Papeete, Tahiti, about Feb. 26, 1969, to collect specimens with a set net and fish for tuna with a seine net. She will return to Tokyo March 17, 1969. ("Suisan Keizai Shimbun," Nov. 7, 1968.)

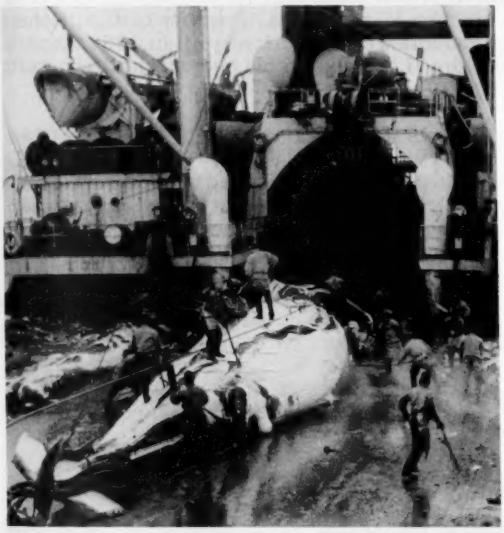
* * *

SENDS WHALING FLEETS TO ANTARCTIC

Three Japanese fleets are whaling in the 23rd Antarctic season, which began Dec. 12,

Japan (Contd.):

1968. Japan has been assigned a national catch quota of 1,493 blue whale units (BWU) for the 1968/69 season. The other two whaling countries, the Soviet Union and Norway, were assigned quotas of 976 and 731 BWUs. Overall catch quota was set at 3,200 BWUs. Because of the depressed whale-oil market, Norway, pioneer in Antarctic whaling, did not send a fleet. ("Suisan Keizai Shimbun," Nov. 22, 1968.)



Cutting up whale aboard a Japanese whaling motherhsip in Antarctic.

日本

Philippines

PLANS TO INCREASE
FISH PRODUCTION IN 1969

The Philippine Fisheries Commission estimated that 1,310,000 metric tons of fish were needed in 1968 for nutrition. It also estimated 1968 production would be only 856,000 tons. The 454,000-ton deficit was covered, in part, by an estimated $15 million worth of imported fishery products. The Commission has a 4-year program (1968-72) to increase production.

The Commission has estimated that nutritional requirements for fishery products increase 3% annually, roughly the same rate as population increase, and that annual fish production will increase 6%. If the percentage increases remain the same, the deficit would not be overcome until 1991. The Commission hopes the Philippines will be self-sufficient in fish products by 1972.

FY 1969 Program

The program for Fiscal Year 1969 (FY 1969) seeks to increase production by 115,000 metric tons from these sources:

Commercial fishing	47% - 54,000	metric tons
Municipal fishing	22% - 25,000	" "
Brackish water fishing	17% - 20,000	" "
Freshwater fishing	14% - 16,000	" "

Commercial fishing is the catch from vessels over 3 tons. Municipal fishing, from coastal waters, is catch used for sustenance rather than commerce.

Increased yield of fish per hectare and catch per vessel will be emphasized in FY 1969 because this approach will provide quicker results. Only limited efforts will be made to increase fish-pond area or the number of vessels. A major program to stock inland waters with fingerlings, mostly bangos and carp, should increase fish harvest 7,500 tons from freshwater ponds, and 8,500 from inland waters.

To Train Technicians

The Commission also plans to train 541 technicians to provide technical assistance for 1,000 commercial fishing vessels (about 33% of those in greater Manila area), build fish preservation and processing establishments, develop 17,000 hectares of fish ponds, and aid fishing villages.

Other projects planned for FY 1969 are more ice plants, cold-storage facilities, and a fish market and fishermen's port for the greater Manila area. The Commission also intends to improve research, fishery administration, and fishery-law enforcement.

* * *

TUNA LONG-LINER IN ATLANTIC

The tuna long-liner 'Dianne,' 240 gross tons, is fishing albacore tuna off the Azores under a cooperative agreement with a Puerto Rican packer. The vessel, based at Sao Vicente, Cape Verde Islands, was averaging 3.5-4 tons a set. ("Shin Suisan Shimbun," Nov. 18, 1968.)

Singapore

THE FISHING INDUSTRY

Singapore was a fishing village when Sir Stamford Raffles acquired it for the East India Company in 1819. Under British rule, it turned quickly to other pursuits and has never been the fishing center that its geographical location might suggest. Even today, as the present government boosts fish processing as a means to cut food imports and to earn export dollars, coastal fisheries are increasingly threatened. The rapid industrialization of land-short Singapore is destroying fish and shrimp ponds, and driving marine life from traditional fishing grounds. In the years ahead, catch from local waters will be severely affected by additional oil refineries, and other industries, at newly filled coastal sites.

Commercial Landings

The majority of landings are made by foreign vessels. Over half the landed fish are from West Malaysian waters; fishing in Indonesian waters is still risky for Singaporean and Malaysian boats. The gradually increasing number of Singapore boats reflects government pressure to put locally owned craft under the national flag. Construction of new units for the fleet is insignificant in relation to the total in operation.

Catch Utilization

Nearly all the commercial catch, retailing fresh or frozen, is consumed locally. One plant, employing 300 workers, includes such Chinese-type products as shark's fin soup and sauced shrimp in a wide range of canned products for export. Otherwise, fish processing is minor, although a shrimp-freezing operation began in early 1968. The commercial catch landed supplies less than a fifth of all fish eaten. No statistical record of catch by species, or processing by product type, is maintained except in very general terms.

Consumption

Annual per-capita fish consumption is high, just over 60 pounds in 1967, about 5 pounds above the 1960-65 average. Besides providing protein to a rice-eating population, fish is acceptable to the various diets of Singapore's multireligious society; it is consumed in many forms alien to non-Asian tastes. Tuna, however, is not popular, although local waters contain several species.

Foreign Trade

In 1967, fish made up 5.6% of the value of all food and live-animal imports. Malaysia was the chief supplier, except for the more exotic items--sea slugs, shark's fins, etc. These are valued as much for their supposedly therapeutic effect as for their taste appeal and, traditionally, come from Mainland China and the Middle East. Imports of U.S. fishery products were practically nil in 1967; exports to the U.S. were limited to shellfish worth US$90,000.

Vessels and Gear

Conversion to powered vessels, mainly the purchase of outboard motors by coastal fishermen, has accelerated slightly in recent years. Construction of modern, long-range units is limited. Coastal fishermen in Singapore, Malaysia, and Indonesia object to trolling as they do to drive-in-net fishing, a Japanese technique. The larger vessels long-line for pelagic fishes, profiting from the Singapore consumer's varied tastes, which include barracuda, horse mackerel, and shark.

Employment

Although the latest census showed fishery employment had dropped to 3,700 in 1965, it did not include fish-pond operators fishing carp and other freshwater fish; also, it omitted coastal fishermen using long-lines with fewer than three hooks. It is estimated, therefore, that 4,000 to 4,200 persons regularly gain their living from fishing and fish processing. Fishing enjoys little prestige among the Chinese. The number of Chinese fishermen probably will continue to decrease but there may be some increase in the processing force, mostly female.

Singapore has a research station, but it still lacks a practical training center like the one at Penang in Malaysia. Greater effort will have to be made if Singapore is to have a corps of efficient fishermen able to use modern techniques to harvest the oceans.

India

PLANS TO DEVELOP
KERALA STATE FISHERIES

The central government was expected to approve a US$2.6 million fishing development plan for Kerala State. Ice plants, processing plants, and 18 fish harbors are planned. Thirty-one deep sea trawlers, to fish shrimp, tuna, and perch, are to be purchased over a 2-year period. The development is expected to yield 10,000 metric tons for the domestic market, and an unspecified amount for export. ("Seafood Trade Journal," June 1968.)

* * *

DEEP-WATER SHRIMP FOUND
OFF KERALA COAST

In early 1968, Indo-Norwegian Project (INP) trawlers discovered a bed of deep-water shrimp in 150 to 200 fathoms off Quilon. Processors and exporters are hoping these grounds will provide commercial quantities.

Women and girls packing shrimp at a deep-freeze plant in Cochin.

From 1958 to 1963, the University of Kerala's Oceanography Department surveyed Kerala's Continental Shelf at 150 stations over an area of 4,800 square miles. Large numbers of Penaeopsis philippi and Penaeopsis rectacutus were collected from stations beyond the 100-fathom line. P. philippi was found occupying an almost continuous bed near the 100-fathom line; the maximum intensity was between Cochin and Calicut. P. rectacutus, less abundant than P. philippi, was found in quantity only in the deeper stations.

The University's collections were predominantly Penaeopsis, while INP catches were mostly Parapandalus and Hetrocarpus.

Need for Future Surveys

Now that INP has found these new commercially exploitable grounds, India should intensify offshore surveys to find the raw materials for an industry that is operating below capacity. ("Seafood Trade Journal.")

Taiwan

PUSHES LARGE FLEET BUILDUP

Taiwan is planning a 5-year fishing fleet expansion program to increase annual production from 458 metric tons to about 800,000 tons in 1972. It hopes to build 155,000 gross tons by 1972 for 5.85 billion yuan (US$146.3 million); 139,000 tons will be for distant-water fisheries. Construction loans will be obtained from the World Bank, domestic banks, the Latin American Fund, Asian Development Bank, and Japan.

A full view of 'Chung Hsin 32,' a steel hull otter trawler of 150-ton class launched in August 1959.

Foreign Firms Profit

To prevent the outflow of profit to foreign firms now handling the transportation of catches, sales, and ship supplies for local vessels, the government will establish the China Marine Trading Public Corp. to handle these services. The agency will start operating as soon as 30 million yuan (US$750,000) is available. ("Shin Suisan Shimbun Sokuho," Nov. 9, 1968.)

Sardine fleet in Agadir, Morocco.

AFRICA

Sudan

MOTHER-OF-PEARL INDUSTRY GROWS

An industry initiated with United Nations help has given some Sudanese an alternative to fishing as a source of income. The Mohamed Qol camp in the Donganab Bay area is the center of a mother-of-pearl industry. The camp's inhabitants, the coastal Hadendowa people, used to depend exclusively on fishing for a livelihood.

Supplies Button Factory

The mother-of-pearl shells are the main source of raw material for a button factory at Port Sudan, 100 miles south.

Fig. 1 - Divers in Donganat Bay show mother-of-pearl shells. The 2 shells commercially valuable are the Trochus and Mother-of-Pearl used primarily in manufacturing buttons. With UN help, Sudan is trying to introduce better methods of collecting shells and stricter grading.

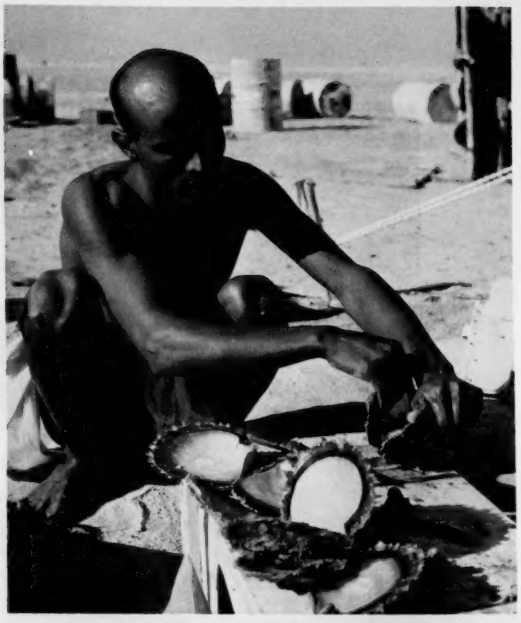


Fig. 2 - a&b - At Mohamed Qol camp, a fisherman cleans mother-of-pearl shells he has just brought ashore from the cultivation beds in the Red Sea. With a companion, he builds a mound behind him.

Sudan (Contd.):

Fig. 3 - Sorting shells at button factory. (UN photos)

INDEX

FIRST NIGHTERS ACCLAIM SEAFOOD STARS

Bravo! Encore! You'll get an ovation, and your guests will demand curtain calls when you feature two star performers from the Pacific Northwest in your dinner productions. King crab and halibut are the featured players in recipes designed to please the gourment tastes of the world traveler, yet simple enough to become family favorites.

Although your guests may be as critical as first nighters, they will applaud when Curtain-Call Crab appears on the menu. Crab meat, one of America's choicest seafoods, is always a talented performer and excels in this production. High in valuable protein, vitamins and minerals, crab meat is always in demand when good eating is on the program. The crab meat is supported in an easy-to-do casserole by a colorful cast of hard-cooked eggs, bread crumbs, a wisp of onion, a tang of lemon, a touch of pimiento, and a custard mixture, then baked until firm with a butter crumb topping. Be ready for repeat performances when Curtain-Call Crab is introduced to your audience.

You can set the stage for real down-to-the-sea eating enjoyment with Encore Halibut as the star! Halibut, the largest actor of the flatfish family, resembles a flying carpet as it ripples through the water. This firm, flavorful fish has a white flesh that is highly prized. In this recipe the halibut is broiled until flaky and then shares the stage with asparagus spears and a topping of cream Cheese Hollandaise Sauce. Encore Halibut is sure to be a long-run hit--try it soon!

The methods for purchasing, handling, storing, and preparing fish are included in the new, 60-page, complete guide to fish cookery, "Let's Cook Fish." This valuable, full-color reference and recipe book is available by sending 60¢ to the Superintendent of Documents, Washington, D. C. 20240.

CURTAIN CALL CRAB

- 2 packages (6 ounces each) king crab meat or other crab meat, fresh, frozen, or pasteurized
  or
  2 cans (6½ or 7½ ounces each)
- 1 cup soft bread crumbs
- 1 cup milk
- 2 tablespoons butter or margarine
- 1 tablespoon finely chopped onion
- 1 egg, well-beaten
- 1 teaspoon lemon juice
- ½ teaspoon salt
- Dash pepper
- 2 hard-cooked eggs, chopped
- 1 tablespoon chopped pimiento
- ½ cup soft bread crumbs
- 2 tablespoons melted butter or margarine

Thaw frozen crab meat. Drain crab meat. Remove any remaining shell or cartilage. Cut crab meat into 1 inch pieces. Combine crumbs, milk, butter, and onion. Bring to a boil. Combine egg, lemon juice, salt, and pepper. Gradually stir hot milk mixture into egg mixture. Stir in chopped egg, pimiento, and crab meat. Pour into a well greased quart casserole. Combine crumbs and butter. Sprinkle over top of casserole. Bake in a moderate over, 350° F., for 40 to 45 minutes or until firm in the center. Makes 6 servings.

ENCORE HALIBUT

- 2 pounds halibut steaks or other fish steaks, fresh or frozen
- ¼ cup butter or margarine, melted
- 1 teaspoon salt
- Dash pepper
- 1 package (10 ounces) frozen asparagus spears
- Cheese Hollandaise Sauce
- Paprika

Thaw frozen steaks. Divide into 6 portions. Place fish on a well-greased baking pan, 15 x 10 x 1 inches. Combine butter and seasonings. Pour over fish. Broil about 4 inches from source of heat for 10 to 15 minutes or until fish flakes easily when tested with a fork. Baste once during broiling with butter in pan. While fish is broiling, cook asparagus according to directions on package. Place fish on a warm serving platter. Arrange asparagus spears on fish. Top each serving with Cheese Hollandaise Sauce. Sprinkle with paprika. Makes 6 servings.

Cheese Hollandaise Sauce

- 1 package (8 ounces) cream cheese, softened
- 2 eggs
- 2½ tablespoons lemon juice
- Dash salt

Cream the cheese until light and fluffy. Add eggs, one at a time, beating thoroughly after each addition. Stir in lemon juice and salt. Cook in top of a double boiler over hot water until thick and fluffy, stirring constantly. Serve warm. Makes 1½ cups sauce.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1969 341-143/6

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

Serving Meals in Quantity

One purpose of BCF's Branch of Marketing is to provide educational materials and services to schools, restaurants, military establishments, cafeterias, and other organizations that serve meals in quantity. Through information on quality maintenance, preparation methods, menu planning, product availability and variety--this effort expands the utilization of fishery products in mass-feeding outlets.